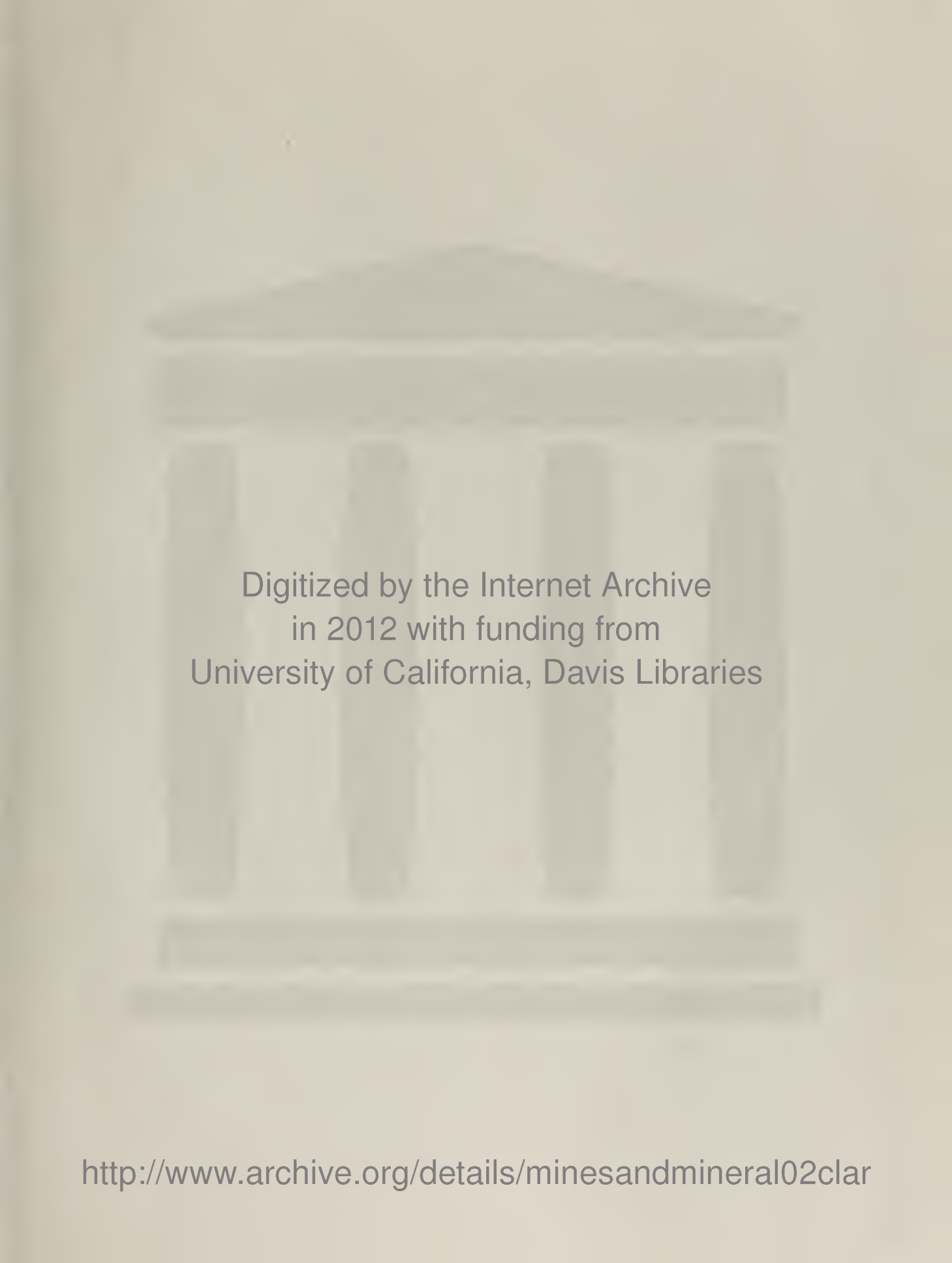

MINES AND MINERAL RESOURCES OF CALAVERAS COUNTY, CALIFORNIA

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County Report 2

CALIFORNIA DIVISION OF MINES AND GEOLOGY
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COUNTY REPORT 2
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ILLUSTRATIONS

Frontispiece (next page). Pardee Dam from Calaveras County side. *Photo by Mary Hill.*

ABSTRACT

Calaveras County, an area of 1,028 square miles, lies chiefly in the Sierra Nevada. The terrain ranges from low rolling foothills in the western portion to rugged high mountains in the east. It is drained by several rivers that flow west-southwest in deep canyons. Much of the area is accessible by state highways and county roads. Calaveras County was visited by white men as early as 1806. During the gold rush days, many thousands of gold-seekers worked the streams, and numerous towns were established, many of which have since disappeared. Important industries besides mining include lumbering, agriculture, and vacation and resort services. Each year Calaveras Big Trees State Park and the Jumping Frog Jubilee at Frogtown attract many visitors.

The rocks in Calaveras County are divided into two major groups—the older Bedrock series and the younger Superjacent series. The Bedrock series consists of broad northwestward-trending belts of steeply dipping, intensely folded and faulted metamorphic rocks of Paleozoic and Mesozoic age that have been intruded by large granitic masses and by smaller bodies of basic and ultrabasic rocks. Associated with the intrusion of the granitic rocks was widespread deposition of gold-quartz veins in the Mother Lode, in the East Belt, and in the West Belt. Copper and zinc were deposited in the Foothill copper belt. Chromite deposits were formed during the intrusion of ultrabasic rocks. The Superjacent series consists of nearly flat-lying beds of auriferous gravel, clay, sand, and volcanic rocks of Tertiary and Quaternary age.

Since 1880, the value of the total recorded mineral production for Calaveras County has been about 200 million dollars. Of this amount, gold, copper, limestone, and limestone products have accounted for the greatest portion. Other mineral commodities that have been produced in quantity include zinc, silver, lead, chromite, clay, stone, and sand and gravel.

Large quantities of gold were produced in the county prior to 1880, but production records are not available. The chief source of lode gold has been the Mother Lode belt, but appreciable quantities have been mined at West Point, Sheep Ranch, and Murphys in the East Belt and at Hodson in the West Belt. The principal sources of lode gold have been the Angels, Boston, Carson Creek, Carson Hill, Collier, Gold Cliff, Gwin, Lightner, Madison, Mountain King, Royal, Sheep Ranch, Utica, and Washington mines. By-product gold has been recovered in quantity from the Foothill copper-zinc belt. Large amounts of placer gold have been mined in the county. The chief sources of placer gold have been rich surface placers mined during the early days of the gold rush, and later the drift and hydraulic mines on Tertiary channels in the Murphys, Douglas Flat, Vallecito, Angels Camp, Mokelumne Hill, and San Andreas areas. Floating bucket-line dredges on the Mokelumne River yielded substantial amounts of gold in the early 1900s, and dragline dredges were productive during the 1930s. At present, only minor amounts of gold are produced in the county.

The annual mineral production for the past few years has averaged about 9 million dollars in value. The production of the Calaveras Cement Company accounted for the largest part of this figure. Since World War II, this concern's output has tripled. There are extensive undeveloped limestone and dolomite deposits in Calaveras County, particularly in the Columbia, Murphys, Cave City, and Jesus Maria areas. Large amounts of copper were mined in the Foothill belt at Campo Seco and Copperopolis during the 1860s and again during two world wars. In later operations, considerable amounts of zinc and some by-product lead were recovered. At present minor amounts of cement copper are being recovered from mine waters.

For years, clay from the Ione formation has been mined at Valley Springs and used in the manufacture of sewer type. Silica sand from the same formation was mined at Camanche and processed in a recently erected plant for use in the manufacture of glass containers. Tungsten and molybdenum were mined recently from contact-metamorphic deposits at Garnet Hill.

Local stone has been utilized in many different products such as dimension and decorative stone, crushed rock, road construction materials, roofing granules, and sand and gravel. Granite, limestone, greenstone, schist, rhyolite tuff, serpentine, sandstone, soapstone, smelter slag, placer and lode gold mine tailings, and stream gravels have been the rock types used as raw-material sources. The State Division of Highways has sampled and tested many deposits of road-construction materials in the county. In the past, large amounts of aggregate were used in the construction of several major dams. Much of the county's present aggregate output is from Chili Gulch.

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INTRODUCTION

Geography. Calaveras County lies chiefly on the west slope of the Sierra Nevada; the extreme western portion is in the Great Valley. Almost triangular in shape, the County is bounded by Amador County on the north, Alpine County on the east, Tuolumne County on the South, and San Joaquin and Stanislaus Counties on the west. Calaveras County has an area of 1,028 square miles.

Topography ranges from low rolling foothills in the west to rugged high mountains, with elevations of more than 8000 feet, in the east. The area is drained by several rivers flowing west-southwest, all of which have steep-walled canyons. The Mokelumne River forms the northern boundary of the county, the Calaveras River flows across the central portion, and the Stanislaus River forms the southern boundary. There are no natural lakes in the county, but there are a number of reservoirs where water is stored for domestic, irrigation, and power uses. The largest are the Calaveras, Melones, Pardee, and Salt Springs Reservoirs.

The principal towns are Angels Camp, which had a population of 1,147 in 1950, and San Andreas, the seat of county government, with a population of 1,263. Other towns include Altaville, Camanche, Copperopolis, Melones, Milton, Mokelumne Hill, Murphys, Sheep Ranch, Valley Springs, and West Point.

State Highway 49 traverses the central portion of the county in a northwest direction via Melones, Angels Camp, San Andreas, and Mokelumne Hill. State Highway 12 extends east from Lodi to Valley Springs and ends at San Andreas; State Highway 8 extends northeast from Stockton to West Point via Valley Springs, Mokelumne Hill, and Glencoe; and State Highway 4 extends east and northeast from Stockton through Copperopolis, Angels Camp, Murphys, and across the Sierran crest via Ebbetts Pass. There are also a number of county roads providing access to the area. A branch line of the Southern Pacific Railroad extends east from Lodi through Valley Springs and terminates at Kentucky House. Years ago, Milton was served by a branch line of the Southern Pacific, and Angels Camp by a branch line of the Sierra Railroad.

History. Calaveras County was named for the Calaveras River. The word means "skulls" in Spanish and was given to the river by Gabriel Moraga, a Spanish Army lieutenant who found many Indian skulls along the banks below San Andreas. He visited the region in 1806 and is believed to have been the first white man to enter what is now Calaveras County. The first American to visit the region was Jedediah Smith, who crossed the Sierra Nevada in 1827 with a party of trappers, presumably over the Ebbetts Pass. In 1840 a group of French trappers from French Camp near Stockton established a camp 2 miles east of Mokelumne Hill. Kit Carson came through the eastern part of the county in 1844 searching for a pass for the Fremont expedition. Captain John Sutter visited the region in 1846 to obtain lumber.

Soon after James Marshall's historic gold discovery at Coloma on the American River early in 1848, large numbers of gold seekers arrived in what is now Calaveras County to work the streams. By the end of 1848 the entire Calaveras County region had been fairly well explored. Mining settlements such as Angels Camp, Carson Hill, Cherokee Flat, Dogtown, Douglas Flat, Melones, Murphys, San Antone, and Vallecito were established, some almost overnight. Many of these towns exist today, but others have disappeared.

Figure 1. Index map showing location of Calaveras County.

In 1850, Calaveras County was established as one of California's original 27 counties. At that time it was nearly four times its present size, and included all of Alpine and Mono Counties, most of Amador County, and part of Inyo County. The first designated county seat was Pleasant Valley, west of Jenny Lind, but the county government was never established at that locality. The town of Double Springs was the site of the first county seat occupied. Soon afterward, however, the county offices were moved to Jackson, and in 1853, when Amador County was created, they were moved to Mokelumne Hill. The last change was made in 1866, when San Andreas became the county headquarters.

A number of outlaws, including Billy Mulligan, Sam Brown, Three-Fingered Jack, and Blark Bart, were active in Calaveras County during the early days. The most notorious of all California bandits, Joaquin Murrieta, was active in the county at various times during his career. Bret Harte and Mark Twain wrote of the region.

The rich surface placers which sustained the initial gold rush soon were exhausted. Hydraulic and drift mines then became the chief source of gold, and later the lode-gold mines. During the Civil War years of the early 1860s, copper "booms" in the Copperopolis and Campo Seco areas made Calaveras County the leading source of copper in the State.

Later, the economy of the county became more diversified, and lumbering, stock raising, and fruit growing became important sources of income. The Calaveras Cement Company plant was built in 1925 and is now a major industry in the county. Tourist and resort services are also an important part of the economy. Calaveras Big Trees State Park, which was established in 1931, is a major tourist attraction.

Industries. Lumbering, mining, agriculture, and tourist and resort services are the chief industries in Calaveras County. There are more than 20 sawmills in the county, and in 1958 the timber stand was estimated to be 5.4 billion board feet (California Blue Book, 1958, p. 887). The Calaveras Cement Company, the major segment of the mining industry, has a total payroll of more than 400

persons. Livestock and livestock products form the largest part of the county's agricultural production. Hay is the chief crop, but some fruits and nuts are raised.

Large numbers of tourists visit the county each year. The Calaveras Grove of giant sequoias is a major attraction; other natural attractions are Mercer Caverns and Moaning Cave. The eastern portion of the county is visited by numerous hunters and fishermen. Other tourist attractions are the historic mining towns and the yearly Jumping Frog Jubilee at Frogtown, just south of Angels Camp. This colorful jubilee is based on Mark Twain's story of the "Jumping Frog of Calaveras County".

Acknowledgments. The authors are greatly indebted to Denton W. Carlson of the Aerojet Corporation, formerly Mining Geologist, California Division of Mines, who initiated this study of the county, and who collected some of the data embodied in this report. Harry Bush, mining engineer of Angels Camp, supplied valuable data on the Copperopolis copper and Hodson gold mines. Jeffrey Schweitzer, mining engineer of Jackson, and the late H. G. O'Hanlon of West Point, supplied information on the West Point gold mines. The late D. C. Demarest of Berkeley was the source of much information on the earlier history of mining in Calaveras County, particularly the gold mines in the Angels Camp area. Fred Stevenot of San Francisco, owner of the Carson Hill mines, supplied information on the history of operations in that area.

Others who were of assistance were the staff of the Calaveras Cement Company plant, especially Grant Metzger, Orrin Weeks, E. M. Bagley, Willard Fuller, and T. C. Slater. Other company officials who provided data included T. H. Word of the Utica Mining Company; H. W. Coke, Pacific Clay Products; L. A. Sanchez, Blackstone Mining Company; and C. W. Decker, Moore Creek Mining Company. Other mine and property owners or persons familiar with the area who provided information included Edward Solinsky, L. A. Lavensaler, Otto Brink, C. J. Loomis, Henry Peterson, Harry Sears, Tom Blazer, F. A. Moss, Raymond Cuneo, Raymond Garamendi, C. W. Nielsen, Mrs. Ruby Taylor, and the late W. A. Hooten.

The offices of the Calaveras County Assessor and Tax Collector and the Sacramento office of the U. S. Bureau of Land Management made available records dealing with property locations and ownership. Various portions of the manuscript were reviewed by the following members of the staff of the Division of Mines: Gordon B. Oakeshott, Fenelon F. Davis, Oliver E. Bowen, Richard M. Stewart, Salem J. Rice, and Harold Goldman. Mary R. Hill took some of the photographs used in the report. Also, a considerable proportion of the data was obtained from older reports by C. A. Logan, who for many years was District Mining Engineer in Sacramento.

GEOLOGY

General Features

The rocks in Calaveras County can be divided into two major assemblages—the "Bedrock series", consisting of steeply dipping metamorphic rocks of Paleozoic and Mesozoic age, and intrusive rocks of Mesozoic age; and the "Superjacent series", the overlying nearly flat beds of sedimentary and volcanic rocks of Tertiary age.

The metamorphic rocks occupy broad belts trending north-northwestward in the central and western portions of the county. They are by far the most abundant rocks in the county and cover slightly more than two-thirds of the total area. They consist of schist, slate, and limestone of the Calaveras formation (Carboniferous and Permian?); schist, greenstone, and slate of the Amador group (Middle or Upper Jurassic); slate of the Mariposa formation (Upper Jurassic); and amphibolite and chloritic schist, greenstone, and phyllite of undetermined age. Granitic rocks, exposed chiefly in the narrow eastern portion, range in composition from granite to gabbro, granodiorite being the most abundant type. Smaller amounts of basic and ultrabasic intrusive rocks, largely altered to serpentine, are found in narrow, northwestward-trending lenses in the west-central portion of the county.

The Tertiary rocks consist of quartz sand, clay, and auriferous quartzose gravel of the Ione formation (Eocene); rhyolitic ash and tuff of the Valley Springs formation (Miocene); and andesitic detritus of the Mehrten formation (Mio-Pliocene). Small patches of basalt of Quaternary age are found in the eastern portion of the county. Recent sand and gravel lie in and adjacent to the present stream beds. Small glacial moraines are found in the eastern part of Calaveras County.

Geologic Structure

The Sierran bedrock complex in Calaveras County is characterized by a series of northwestward-trending beds of metamorphic rocks that have been intensely folded and faulted and invaded by a series of intrusive igneous rocks, chiefly granitic. Interpretation of the geologic structure in the metamorphic rocks often is extremely difficult because of its complexity, the destruction of bedding by shearing, and the absence of key horizons. Taliaferro, in separating the Amador group, has been able to work out the intricate structure in the bedrock in the vicinity of the Cosumnes River to the north in El Dorado and Amador Counties (Taliaferro, 1943, p. 285, 306). Eric, Stromquist, and Swinney (1955, pp. 22-30) have mapped the structure both west and east of the Mother Lode in the vicinity of Angels Camp and Sonora. Clark (1954, pp. 11-14) has studied the geologic structure of the Calaveras formation in the Calaveritas quadrangle, and Taliaferro and Solari (1944) have mapped structures in the Copperopolis area.

The metamorphic rocks are characterized by beds and foliation that strike northwest, parallel to the trend of the Sierra Nevada; vertical or steep easterly and north-

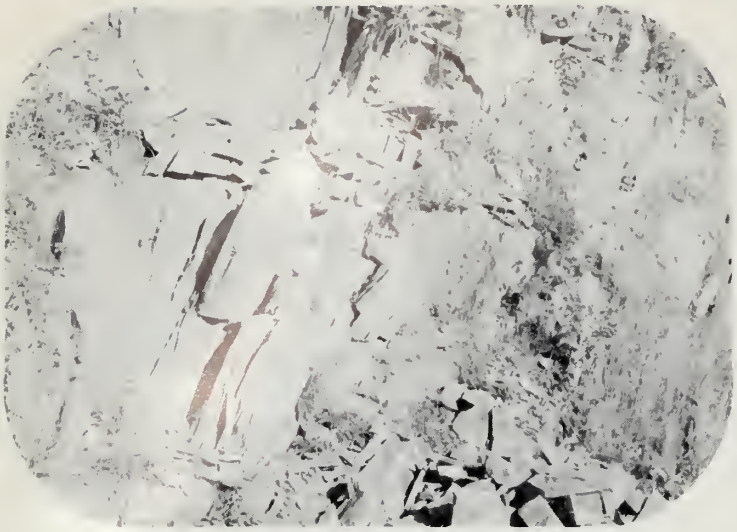


Photo 1. Micaceous slote of the Caloveros formotion exposed in roadcut north of San Andreos. Pick (lower center) shows size of rock frogments.

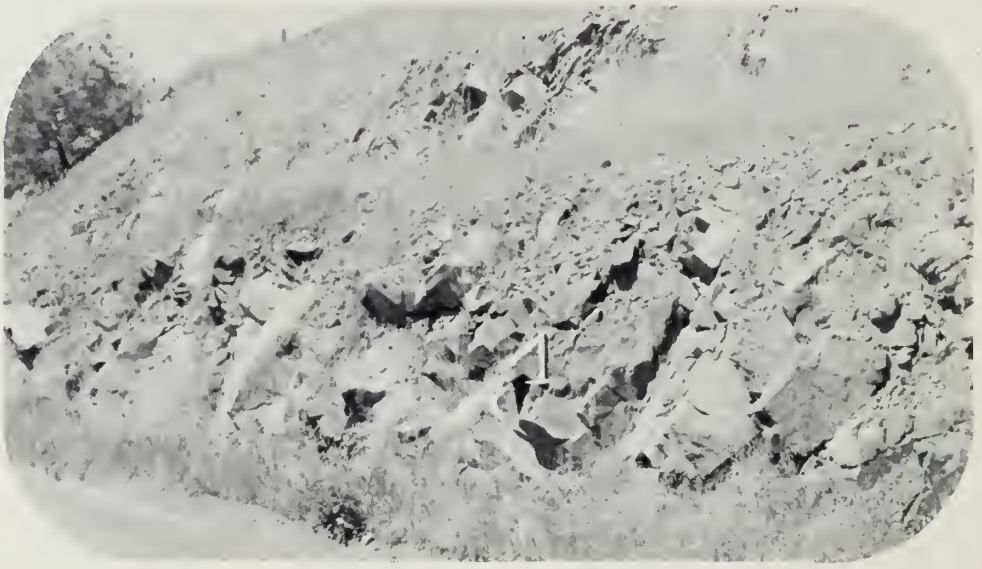


Photo 2. Blocky greenstone exposed in roodcut, 3 miles west of Son Andreos.

Photo 3. Tombstone-like outcrops of greenstone in the Copperopolis oreo. *Photo by Mary Hill.*

easterly dips; and overturned, nearly isoclinal folds. The repetition of beds, particularly those of the Mariposa slate and greenstone west of the Mother Lode, results from this folding. The Mother Lode vein system extends across Calaveras County in a northweastward direction. It is a major fault zone in which there has been reverse movement, but the amount of displacement is largely unknown. Gold-bearing quartz veins have been deposited within the fissures. Ultrabasic intrusions west of the Mother Lode are largely serpentinized and trend northwest, reflecting the major structural trend of the region. The acidic batholithic masses were intruded after the beds had been folded (Taliaferro, 1943, p. 285) and probably after many of the displacements in the Mother Lode fault zone.

Major faulting along the east flank of the Sierra Nevada has had a profound influence on the later geologic history of Calaveras County. Faulting occurred on the east flank during the end of the Pliocene epoch and at the beginning of the Pleistocene epoch. The Sierra Navada was elevated and became asymmetrical in form, with a broad, gently dipping western slope and short, steeply dipping eastern slope (Hinds, 1952, p. 18).

Rock Units

Calaveras formation (Carboniferous and Permian in part). The Calaveras formation is a suite of undifferentiated metamorphic rocks that underlies extensive areas in the central and east-central portions of the county. The rocks of the group are quartz-mica schist, graphitic schist, low-grade carbonaceous slate, fine-grained quartzite, highly contorted and poorly bedded recrystallized chert, and recrystallized limestone and dolomite. Present in smaller amounts are sheared conglomerate, chlorite and talc schist, and massive greenstone. In places, tectonic breccia consisting of quartzite fragments in a matrix of graphitic schist is common. Beds of the Calaveras formation generally have a north to northwest strike and dip steeply to the east. In the Murphys-Calaveritas area, they strike westward and dip steeply to the north.

On the basis of fossils found in limestone, the Calaveras has been classified as Carboniferous in age, although recent investigators believe that part of the group may be of Permian age (Taliaferro, 1943, p. 280).

Amador group (Middle to Upper Jurassic). The Amador group consists of metamorphosed sedimentary and volcanic rocks in north- to northwest-trending beds west of the Mother Lode in western Calaveras County. The group is divided into two formations—the Cosumnes, which lies unconformably on the Calaveras formation, and the overlying Logtown Ridge. On the geologic map (pl. A), the Amador group is included with undifferentiated metamorphic rocks.

The Cosumnes formation is composed of sheared tuffaceous siltstone and sandstone, gray to black clay slate, thinly bedded tuff, small amounts of quartzite and chert, and a thick basal conglomerate containing pebbles and boulders of chert, quartz, schist, and volcanic rocks in a sandy or gritty matrix.

The overlying Logtown Ridge formation consists predominantly of blocky metamorphic rocks derived from pyroclastic rocks. The most characteristic rocks are massive greenstone derived from augite andesite, and basaltic and andesite agglomerate. Both commonly contain large phenocrysts of augite and plagioclase in a fine-grained groundmass. Also present are bedded tuffs, agglomerates, and smaller amounts of conglomerate and dark clay slate.

Mariposa formation (Upper Jurassic). The Mariposa formation is principally in two northwest-trending belts, 1 to 2 miles wide, in the west and west-central portions of Calaveras County. The formation consists predominantly of dark gray to black carbonaceous clay slate. Present in smaller amounts, most commonly in the Angels Camp area, are dark gray sandy tuff and tuffaceous graywacke. In places there is a sheared conglomerate containing pebbles and cobbles of chert, quartz, schist, and volcanic rock. In the northern part of the county, this formation contains the Mother Lode gold belt; but south of San Andreas, the Mother Lode is east of the Mariposa formation.

Undifferentiated metamorphic rocks (Jurassic and/or Carboniferous (?) in part). This group of metamorphosed sedimentary and volcanic rocks of pre-Cretaceous age forms extensive northwest-trending belts in and near the Mother Lode gold belt. This group has been tentatively correlated with the Amador group (Eric, Stromquist, and Swinney, 1955, p. 15). The metasedimentary rocks consist of phyllite, quartz-mica schist, phyllonite, and stretched conglomerate. The metavolcanic rocks are green schist, derived from basaltic and andesitic breccia and tuff, and smaller amounts of sericite schist. On the geologic map (pl. A), the Amador group also is included under this designation.

Serpentine and associated rocks (Jurassic). Northwest-trending lensoid serpentine bodies are found along the Mother Lode belt in the Angels Camp-Carson Hill area, east and northeast of Copperopolis, and between Valley Springs and San Andreas. The serpentine ranges from green to black in color and may be massive or highly foliated and slickensided. Associated with the serpentine are minor amounts of gabbro, pyroxenite, talc schist, and, in the area of Carson Hill, appreciable amounts of mariposite-ankerite rock. Locally it may contain veinlets of chrysotile. Also in some places small pods and kidneys of chromite are present. Areas underlain by serpentine commonly are covered with a thick growth of manzanita.

Granitic rocks (Upper Jurassic or Cretaceous). This group of rocks includes granite, granodiorite, quartz diorite, diorite, and gabbro. Hornblende granodiorite is by far the most abundant type. The entire eastern portion of the county is underlain by granodiorite, and there are smaller bodies at Rich Gulch, Jesus Maria, Mokelumne Hill, and east of San Andreas. Small bodies of

Photo 4. Tertiory chonnel grovels exposed in raodcut on the Valley Springs-Son Andreas road.

diorite are present in various areas in the county, especially between Railroad Flat and Mountain Ranch. Several gabbroic bodies are in granodiorite in narrow northwest-trending belts at Angels Camp, about 8 miles west of Angels Camp, and in the eastern part of the county. Diorite gneiss and quartz diorite are closely associated with granodiorite and other intrusive rocks in the eastern portion of the county. These rocks are locally abundant in the vicinity of Garnet Hill and to the west and along the Stanislaus River northeast of Calaveras Big Trees State Park.

Ione formation (Eocene). The Ione formation consists of nearly flat lying beds in the low foothills of northwestern Calaveras County in the Camanche-Valley Springs area. In this county, it is predominantly clayey quartzose sand and interbedded lenses of clay. The Ione sand consists chiefly of medium to coarse angular grains of quartz with small amounts of feldspar, quartz and chert pebbles, interspersed grains of pearly white anauxite, and heavy minerals of which zircon, magnetite, and ilmenite are most abundant. The clay consists largely of kaolinite and a minor amount of anauxite. It is light colored, generally white to yellowish white, but in places tints of gray, pink, and red are common.

Auriferous gravels (Tertiary). The auriferous gravels were deposited in stream channels during the Tertiary period and range from Eocene to Miocene in age. They are in isolated patches, which are remnants of the early channels, and in more extensive deposits that are pre-

Photo 5. Rhyalite tuff of the Valley Springs formation exposed in roodcut neor Mokelumne Hill. *Photo by Mary Hill.*

served by a thick cover of volcanic rocks. The Eocene channel deposits are characterized by a high percentage of pebbles, cobbles, and boulders of white quartz, and by concentrations of placer gold at or near bedrock. The later Tertiary channel deposits, known as the intervolcanic deposits, are characterized by abundant rhyolite and andesite pebbles and are relatively lean in gold as compared with the older Eocene deposits.

The principal gravel deposits of the Tertiary channels in Calaveras County are found between Mokelumne Hill and San Andreas, from Railroad Flat to Sheep Ranch, between Murphys and Angels Camp, in the vicinity of Mountain Ranch and Calaveritas, and in an area just west of San Andreas. Extensive, shallow deposits of Tertiary gravel also are found in a broad north-trending belt between Camanche, Burson, and Jenny Lind. This gravel, which consists largely of quartz and metamorphic rocks, may represent material deposited along the shoreline of the Ione sea by Eocene streams draining the low hills to the east.

Valley Springs formation (Miocene(?)). The Valley Springs formation forms extensive beds in the northwest portion of the county, notably in the vicinity of Valley Springs. Beds are less extensively exposed in the Angels Camp area and on some of the interstream ridges in the Douglas Flat, Sheep Ranch, and Railroad Flat areas. The formation consists predominantly of nearly flat lying beds of white, vitreous rhyolite tuff. Interbedded with the tuff are gravel and breccia, and the lower part of the formation contains clay, silt, and sand.

In the western part of the county, this formation rests unconformably on sand and clay of the Ione formation, but to the east it lies on auriferous channel gravel or Sierran bedrock.

Undifferentiated volcanic rocks. Two small patches of basalt are exposed on a spur east of Devils Nose, 8 airline miles northwest of West Point. The basalt is younger than the rhyolite (Valley Springs formation) and older than the andesite (Mehrten formation).

Mehrten formation (Miocene and Pliocene). The Mehrten formation is found throughout Calaveras County. In the western part of the county, it generally overlies the Valley Springs formation, but in the eastern portion of the county, it is in extensive beds on the interstream ridges, where it rests on crystalline rocks of the Sierran bedrock complex (granite and Calaveras group).

The Mehrten formation consists of deposits of detritus originating near the crest of the Sierra Nevada during a post-Valley Springs volcanic epoch that was characterized by flows of andesitic lava and the eruption of ash. The deposits consist predominantly of andesitic agglomerate of mud-flow origin and smaller amounts of andesitic sandstone, siltstone, conglomerate, and tuff.

Photo 6. Tuolumne Table Mountain as viewed from O'Byrnes Ferry bridge. Comero facing east.

Latite of Table Mountain (Plio-Pleistocene). Extending across part of the southwestern section of the county is a flat-topped, sinuous, steep-sided hill known as Table Mountain. It consists of an erosion-resistant porphyritic augite latite that contains phenocrysts of plagioclase, augite, and olivine in a fine-grained groundmass. The latite occupies a former channel of the Stanislaus River known as the Cataract Channel and overlies Tertiary river gravel.

Glacial moraines (Pleistocene). Small remnants of glacial moraines are found in the high eastern portion of Calaveras County at Big Meadow, Mattley Meadow, and an area north of Camp Tamarack. The moraines contain unsorted and unconsolidated rough boulders and

angular rock fragments mixed with sand and other detritus, and were deposited during the Pleistocene glaciation.

Alluvium (Recent). Recent alluvium consists of silt, sand, and gravel adjacent to and in the present stream channels. It also includes placer and hydraulic mining debris.

Geologic History

The oldest rocks in Calaveras County are metamorphosed sedimentary and volcanic rocks of the Calaveras formation. These for the most part represent marine sediments that were deposited as sand, mud, limestone and marl during the Carboniferous and Permian periods about 350 million years ago. Deposition of calcareous material during the late Paleozoic era gave rise to valuable limestone deposits. Submarine volcanic products and chemically deposited manganese-bearing siliceous sediments were also associated with the late Paleozoic sedimentation. Near the end of the Paleozoic era, crustal movements partially destroyed the Paleozoic sea basin and created a mountain chain of unknown extent.

Between the end of the Paleozoic era and the Middle Jurassic period, another sea advanced over what is now Calaveras County. Near the end of the Upper Jurassic period, marine sedimentation, submarine vulcanism, and marine sedimentation, gave rise to the Cosumnes, Logtown Ridge, and Mariposa formations, respectively. Some small manganese deposits were associated with the submarine vulcanism.

In late Upper Jurassic time, about 125 million years ago, mountain building processes known as the Nevadan Orogeny began to elevate the Sierra Nevada. This effected an almost complete withdrawal of the Mesozoic sea from the Sierra Nevada area. The nearly flat-lying Jurassic sedimentary beds were folded into a complicated series of northwest-trending folds, faulted, and the rocks themselves were metamorphosed. The ancestral Sierra Nevada thus created was a fold-mountain range. Prior to destruction of the Mesozoic sea basin, igneous rocks of peridotitic composition were intruded into the marine sedimentary rocks. These intrusives are now largely altered to serpentine. Chromium mineralization was introduced with the peridotites which later gave rise to chromite deposits.

Toward the end of Jurassic time, granitic rocks of the Sierra Nevada batholith were intruded into the folded crust; after cooling and solidification of the granite, fractures and fracture systems developed. The introduction of mineralized solutions along these and earlier fractures led to the pyrometasomatic deposition of tungsten and hydrothermal deposition of gold, copper, lead, and zinc. A very long period of erosion followed during the early part of the Cretaceous period. The elevation of the Jurassic Sierra Nevada was greatly reduced, and broad river valleys developed. For 20 or 30 millions of years, erosion stripped away the rocks lying above the gold deposits, un-roofed the Sierran granitic rocks and cut deeply into the gold-bearing veins themselves.

During Upper Cretaceous time, a sea advanced eastward over a narrow belt of the ancestral Sierra Nevada marginal to the Great Valley. Marine sedimentation at that time resulted in thin, fossiliferous beds that were laid down on the bedrock along this western belt. Patches of these Upper Cretaceous deposits, gently tilted westward, are found from place to place along the western edge of the present Sierra Nevada except in Calaveras County.

Continued erosion reduced the topography of the ancestral Sierra Nevada, and by early Tertiary time (60 million years ago) the temperate climate which characterized the Jurassic and Lower Cretaceous periods had changed to sub-tropical. The resultant warm humid climate caused chemical decay of the bedrock which proceeded slowly but deeply. The finer products of this decay, chiefly clay and quartz sand, were removed by running water and deposited along the eastern margin of the Eocene sea which lapped onto the western flanks of the ancestral Sierra Nevada in a manner similar to that of the Upper Cretaceous sea during the preceding period. The abundant semi-tropical flora which flourished in the area at that time contributed carbonaceous matter which gave rise to the development of lignite.

The heavier and coarser products of decay during the Eocene, notably gold and quartz pebbles, eroded from the late Jurassic-Cretaceous gold-quartz veins, were deposited and concentrated in stream channels as placer deposits. These Eocene placer deposits were extremely rich in gold and were characterized by an abundance of quartz pebbles and a lack of volcanic debris.

Near the close of the Eocene epoch, vulcanism broke out in the Sierra Nevada which was destined to have a profound effect upon the economic geology of the placer gold deposits. Volcanic activity began with rhyolitic ash falls over areas at lower elevations as well as rhyolitic ash falls and rhyolite flows covering areas at the higher elevations of the ancestral Sierra Nevada, interspersed with periods of quiescence. So much ash fell during the Miocene epoch, particularly at lower elevations, that the drainage system that began to develop after the initial vulcanism formed gravel and placer deposits that were leaner in gold than those of Eocene time and were characterized by an abundance of rhyolite pebbles.

By late Miocene or early Pliocene time, about 10 million years ago, volcanic activity reached its peak with the emission of fluid flows of andesite as well as large volumes of fragmental andesite, the latter frequently giving rise to extensive mud flows. These volcanic products buried the Eocene channels and Miocene intervolcanic channels to depths of several hundred feet. The channels which developed after the andesitic vulcanism were still leaner in gold than the interrhyolitic channels.

Further burial of the Eocene channels by later basalt and latite flows served to protect the gold placers in some measure from obliteration by erosion.

As volcanic activity diminished, re-elevation of the Sierra began in late Pliocene time and continued into the

Summary of economic geology of Calaveras County

Geologic age			Rock units	Rock types	Mineral commodities
Era	Period	Epoch			
Cenozoic	Quaternary	Recent	Alluvium	Sand, gravel, silt	Placer gold, silver, platinum, sand and gravel, black sand
		Pleistocene	Latite of Table Mountain	Latite	Stone
	Tertiary	Pliocene			
		Mio-Pliocene	Mehrten formation	Andesitic detritus	Stone
		Miocene	Valley Springs formation	Rhyolite tuff	Stone, ornamental stone
		Eocene	Ione formation	Clay, sand, gravel	Placer gold, silver, platinum, fire clay, quartz sand, coal, black sand, quartz crystal, iron
Mesozoic	Cretaceous			Vein quartz and mineralized wall rock formed in other rock types	Gold, silver, copper, zinc, lead, pyrite, quartz, stone, quartz crystal, tellurium, cobalt, ornamental stone
				Contact metamorphic rocks related to granitic intrusions	Tungsten, copper, gold, silver, molybdenum, semi-precious stones
			Granitic rock	Granite, granodiorite, diorite, gabbro	Stone
	Middle-Upper Jurassic		Serpentine	Serpentine	Chromite, asbestos, soapstone, nickel, terrazzo chips
			Mariposa formation	Slate	Slate, stone
			Amador group (Logtown Ridge formation, Cosumnes formation)	Metavolcanic rock, metasedimentary rock	Stone
Paleozoic	Permian Carboniferous		Calaveras formation	Metasedimentary rock	Limestone and dolomite, marble, graphite, stone, iron, terrazzo chips

late Quaternary. This was accomplished by major faulting along the eastern flank which tilted the Sierra Nevada to the west. Westward-flowing rivers cut new deep canyons and removed much of the volcanic cover. With increased elevations the temperature was lowered, snow and ice packs formed and began migrating down the slopes as glaciers, elaborately carving the highland topography and further exposing the granitic core of the range. In Calaveras County, the Pleistocene glaciers occupied the eastern portion of the county in the vicinity of Big Meadow and Camp Tamarack.

The rejuvenation of the Sierra Nevada renewed the erosional cycle and permitted continued stripping of gold lodes in Pleistocene and Recent time, thereby enriching the present stream channels with gold. The glaciers retreated from Calaveras County and most of the Sierra about 25 thousand years ago in the early Recent epoch, after which the present climate and topography developed.

MINES AND MINERAL RESOURCES

Since 1880, the recorded value of minerals and mineral commodities produced in Calaveras County has amounted to $200,676,834. Of this total, gold, limestone and limestone products including cement, and copper have accounted for the greatest portion. Large quantities of gold were mined prior to 1880, but production figures are not available. Other minerals that have been produced in quantity include zinc, silver, lead, chromite, clay, sand and gravel, and stone. At least 26 minerals have been produced commercially in the county.

In this chapter the minerals and mineral commodities are described in alphabetical order. In each section the geology, mineralogy, and the more important mines and deposits are described. There are also sections on a number of mineral commodities which have not been mined commercially but are known to be in the county.

Table 1. Mineral production of Calaveras County, 1880-1957

Year	Gold, value	Silver, value	Copper		Lead		Clay		Mineral water		Limestone		Quartz crystals	Miscellaneous and unapportioned		
			Pounds	Value	Pounds	Value	Tons	Value	Gals.	Value	Tons	Value	Value	Amount	Value	Substance
1880	$320,865	$643	[1]													
1881	800,000	1,200														
1882	670,000															
1883	500,000															
1884	485,000															
1885	527,538	2,558														
1886	639,457	4,926														
1887	640,417	1,477														
1888	580,000	1,500														
1889	592,243	1,071														
1890	618,821	2,499														
1891	738,883	4,860														
1892	794,531	24,441														
1893	1,669,192	122														
1894	2,119,365	5,183	654,866	$64,951										115 tons	$2,530	Mineral paint (ochre)
1895	1,717,916	77	175,895	16,925												
1896	1,546,398	500	87,557	8,990												
1897	1,439,861	1,745												150 tons	2,400	Mineral paint (ochre)
1898	1,019,023	3,462	18,400	2,052										100 tons	225	Mineral paint (ochre)
1899	1,265,564	9,813	165,484	27,586												
1900	1,649,126	80,762	980,934	150,585									$18,000	717 tons	3,583	Pyrites
														400 tons	3,800	Mineral paint (ochre)
1901	2,024,685	44,687	1,701,389	268,000									17,500	125 tons	500	Mineral paint (ochre)
1902	2,072,939	46,234	2,087,501	251,062										259 tons	778	Mineral paint (ochre)
1903	1,904,125	68,280	2,246,675	297,263										200 tons	1,000	Mineral paint (ochre)
1904	1,789,184	65,611	2,592,124	414,399			100	$100						3,500 bbl.	5,500	Lime
														25 tons	375	Chromite
1905	1,836,816	78,859	3,666,810	572,022			40	300			3,087	$15,430	10,000	70 tons	385	Mineral paint (ochre)
														20 tons	300	Chromite
														379 tons	1,900	Mineral paint (ochre)
1906	1,644,234	74,099	5,082,320	956,315			50	250			3,994	7,635		40 tons	280	Chromite
														13.9 oz.	250	Platinum
1907	1,097,974	54,420	3,941,883	609,203							6,872	16,955	10,000			
1908	1,378,511	62,727	4,804,446	555,704			25	250			14,165	31,446	10,000	50 tons	250	Mineral paint (ochre)
1909	1,440,511	71,418	5,438,908	690,632			100	500			4,590	11,987			50,075	Unapportioned, 1900-09
1910	1,147,705	82,866	7,345,321	778,369			30	250			6,283	16,976				
1911	1,112,315	67,032	6,190,153	773,769	220	$10	50	200	10,000	$5,000	3,943	11,733				
1912	962,145	70,748	6,125,415	1,010,693			4,281	4,431	7,528	3,764						
1913	1,175,208	61,076	5,063,187	784,794	7,006	308	2,000	4,500	11,500	5,500	2,000	1,400		2,500 lbs.	25	Graphite
														28 tons	190	Mineral paint (ochre)
											44,934	$113,562			9,990	Other minerals
											Miscellaneous stone[3], value					
1914	1,336,875	60,244	4,468,998	594,377	30	1	280	280	15,508	6,517				650 tons	4,550	Chromite
														290 tons	2,618	Fullers earth
														9 oz.	294	Platinum
1915	1,391,134	53,298	4,031,149	705,451	163	8			15,343	5,752	$1,900				4,350	Asbestos, fullers earth, mineral paint, platinum, silica
1916	1,356,120	83,643	6,099,509	1,500,479	7,238	499			18,255	7,025	2,503			1,636 tons	12,570	Chromite
														54 oz.	2,453	Platinum
															300	Other minerals
1917	1,471,442	87,984	7,720,861	2,107,795	6,395	550			16,985	7,009	2,700			1,613 tons	34,245	Chromite
														20 oz.	1,433	Platinum
															3,922	Clay, fullers earth, mineral paint, silica, zinc
1918	871,263	84,150	6,762,882	1,670,432					10,938	6,069	420			3,830 tons	159,453	Chromite
														10 oz.	598	Platinum
															2,067	Asbestos, lead
1919	1,550,574	35,876	2,049,330	381,175	2,019	107			4,384	1,034	600			8 oz.	1,076	Platinum
															8,116	Other minerals
1920	1,439,745	16,701	2,112,186	388,642	[2]				5,120	512	2,400		[2]	20 fine oz.	2,002	Platinum
															30,048	Quartz crystals, lead
1921	1,495,758	10,232	[2]		[2]				2,809	791	17,527			12 fine oz.	876	Platinum
															17	Copper, lead
1922	1,413,465	11,648	[2]				[2]		1,914	639	35,590		[2]	22 fine oz.	2,150	Platinum
															39,391	Clay (pottery), copper, gems
1923	1,205,784	7,316	1,598,776	235,020	[2]		[2]		1,626	569	39,825		[2]		9,605	Clay (pottery), quartz crystals, lead, platinum
1924	853,961	7,463	4,724,441	618,902	[2]				1,400	139	83,250				8,704	Clay (pottery), gems (quartz crystals), lead, platinum ,silica (quartz), soapstone

1925 --	652,433	8,324	4,906,650	696,744	[2]		[2]		[2]		78,506	[2]		14,611	Clay (pottery), gems (quartz crystals), lead, mineral water, platinum
1926 --	576,889	6,229	5,240,927	733,730	[2]		[2]		[2]		59,000	[2]		433,924	Cement, clay (pottery), gems (quartz crystals), lead, mineral water, soapstone
1927 --	219,217	3,982	750,909	98,367	4,606	290	[2]		[2]		[2]	[2]	222 tons	5,063	Chromite
														1,281,795	Cement, clay (pottery), gems (quartz crystals), soapstone, misc. stone
1928 --	162,372	1,469	150,911	21,731	2,817	163	[2]		[2]		557,020	[2]		2,059,787	Cement, quartz crystals, mineral water, platinum, soapstone
1929 --	103,843	3,444	1,200,494	211,287	8,227	521	[2]		[2]		360,982	[2]		1,896,182	Cement, clay, quartz crystals, mineral water
1930 --	112,913	1,555	1,857,248	241,442	1,296	65			[2]		818,507	[2]		909,474	Cement, quartz crystals, mineral water
1931 --	152,771	989	184	17	4,386	162			[2]		185,810	[2]		753,805	Cement, quartz crystals, mineral water, platinum
1932 --	186,378	763	[2]		642	19			[2]		49,254	[2]		498,785	Cement, pottery, clay, quartz crystals, mineral water, copper
1933 --	442,980	1,927	2,248	144	6,363	253	[2]		[2]		46,436			447,259	Unapportioned
1934 --	1,274,862	7,021	144	11	612	23	[2]		[2]		48,339			866,436	Cement, pottery clay, mineral water
1935 --	1,607,242	8,218	[2]		[2]		[2]		[2]		56,519			640,974	Cement, clay, copper, lead, mineral water
1936 --	2,113,055	12,242	1,814	167	4,755	219	[2]		[2]		7,643			1,379,180	Cement, clay, mineral water, platinum, salt
1937 --	1,730,435	9,849	9,703	1,174	1,816	107	[2]		[2]		76,880			1,460,805	Cement, clay, mineral water, slate
1938 --	2,906,225	11,411	25,347	2,487	1,583	73	[2]		[2]		38,991			1,398,751	Cement, clay, mineral water, platinum
1939 --	3,709,895	16,063	[2]		[2]		[2]		[2]		9,955			1,657,940	Cement, clay, copper, lead, mineral water, platinum, slate
1940 --	3,036,390	12,550	7,561	854	[2]		[2]		[2]		14,411			1,169,630	Cement, chromite, clay, lead, mineral water, slate
1941 --	2,613,380	10,610	7,076	835	[2]		[2]				29,410			1,739,804	Cement, chromite, clay, platinum, lead, tube-mill pebbles
1942 --	980,140	5,959	531,618	64,326	[2]		[2]				22,823		8,923 lbs.	830	Zinc
														1,924,157	Other minerals[4]
1943 --	96,460	26,811	4,187,236	544,341	107,655	8,074	[2]				95,180	[2]	1,334,625 lbs.	144,140	Zinc
														1,916,537	Other minerals[5]
1944 --	67,655	41,302	4,952,034	668,524	191,233	15,298	[2]		[2]		88,795	[2]	2,172,165 lbs.	247,627	Zinc
														1,513,437	Other minerals[6]
1945 --	86,870	46,411	3,543,910	478,428	50,253	4,322	[2]		[2]		31,982		4,633,253 lbs.	532,824	Zinc
														1,609,044	Other minerals[7]
1946 --	231,070	89,987	1,859,691	301,270	320,178	34,900	[2]		[2]		23,621		6,601,266 lbs.	805,354	Zinc
														1,946,392	Other minerals[8]
1947 --	180,985	87,854	1,242,000	260,820	180,000	25,920	[2]				[2]		2,350 short tons	568,700	Zinc
														3,075,042	Other minerals[9]
1948 --	41,860	579			2,000	358	[2]						113,871 short tons	204,507	Sand, gravel
														4,414,841	Other minerals[10]
1949 --	105,805	8,176	76,500	15,070	33,300	5,261							31,050 short tons	40,300	Sand, gravel
													726,700 lbs.	90,111	Zinc
														4,782,708	Other minerals[10]
1950 --	94,885	11,316	196,700	40,914	37,900	5,117	[2]						651,000 lbs.	92,442	Zinc
														4,956,138	Other minerals[11]
1951 --	96,215	36,270	487,400	117,951	89,100	15,414					35,000		1,767,300 lbs.	321,648	Zinc
														5,102,995	Other minerals[12]
1952 --	65,695	35,330	528,500	127,897	93,800	15,102							1,658,400	275,294	Zinc
														4,783,689	Other minerals[11]
1953 --	32,760	1,533	56,000	16,072	4,100	537							61,200 lbs.	7,038	Zinc
1954 --	28,840	132												8,032,532	Other minerals[13]
1955 --	13,965	58	17,500	6,527										8,425,671	Other minerals[14]
1956 --														9,994,209	Other minerals[15]
1957 --														11,466,710	Unapportioned[16]
Totals	$78,031,158	$1,960,815	129,777,705	$21,086,717	1,169,693	$122,198	6,956	$11,061	$123,310		$2,921,779	$65,500		$96,304,296	

Grand total value: $200,626,834

Legend

[1]The Union Mine at Copperopolis was a producer as early as 1861, but there are no detailed annual figures available for Calaveras County earlier than shown here.
[2]Under Unapportioned.
[3]Includes crushed rock, sand, gravel.
[4]Cement, chromite, clay (pottery), lead.
[5]Cement, chromite, clay (pottery), gem (quartz), manganese ore.
[6]Cement, chromite, clay (pottery), gem (quartz crystals), mineral water.
[7]Cement, clay (pottery), mineral water.
[8]Cement, clay (pottery), mineral water, pumice.
[9]Cement, raw clay, pumice, sand and gravel, stone.
[10]Cement, raw clay, pumice.
[11]Cement, clay, pumice, and sand and gravel.
[12]Cement, clay, pumice and pumicite, sand and gravel.
[13]Includes cement, clay (raw), pumice, sand and gravel, tungsten concentrates.
[14]Includes cement, clay, pumice, sand and gravel, crushed stone, and tungsten concentrates.
[15]Includes cement, lead, sand and gravel, and tungsten concentrates.
[16]Includes cement, clay (fire), copper, gemstones, gold, sand and gravel, silver, and tungsten concentrates.

Antimony

There has been no recorded production of antimony in Calaveras County. However, stibnite (Sb_2S_3) has been observed with gold at Mokelumne Hill and with cinnabar at the Oro y Plata gold mine near Murphys (Murdoch and Webb, 1948, p. 284). Stibnite also is a minor constituent of some Foothill copper belt ores (Heyl, 1948, p. 20), but none has been reported in Calaveras County. Tetrahedrite ($(Cu,Fe)_{12}Sb_4S_{13}$) is in many of the Foothill copper-zinc ores and also has been found at the Carson Hill, Carson Creek, Live Oak, Ilex, and Blue Wing gold mines (Murdoch and Webb, 1948, p. 295). Jamesonite ($Pb_4FeSb_6S_{14}$) has been found at Mokelumne Hill (Murdoch and Webb, 1948, p. 183).

Asbestos

Chrysotile asbestos has been produced commercially in small quantities in Calaveras County. The two principal properties are the Voorhees or American deposit, 7 miles southeast of Copperopolis and the Turner and Lloyd prospect, 3½ miles due north of Copperopolis. There are several small prospects northwest of San Andreas. In 1961 the Jefferson Lake Asbestos Company began to erect a large mill and began stripping a large area preparatory to a large open-pit operation at the Voorhees deposit.

Serpentine, the host rock of chrysotile asbestos, is abundant in the western portion of Calaveras County (see figs. 15, 16). The asbestos is in cross-fiber seams and veinlets which appear as stockworks in the serpentine. Most of the veinlets are an inch or less in thickness and no more than a few feet in length. They branch, join other veins or pinch out. Ore deposits consist of those portions of the serpentine which contain sufficient asbestos veinlets and seams to be of commercial value.

Jefferson Lake (American, California, Pacific, Voorhees) deposit

Location: secs. 15, 16, 21, and 22, T. 1 N., R. 13 E., M.D.M., 7 miles southeast of Copperopolis and north and west of the Stanislaus River. Ownership: Jefferson Lake Sulphur Company, New Orleans, Louisiana; the operating company is the Jefferson Lake Asbestos Corporation, a wholly owned subsidiary; R. W. Prince, resident manager.

The Jefferson Lake was one of the first chrysotile asbestos deposits to be mined in California. It was originally opened many years ago by the California Asbestos Company. Following this a number of concerns made efforts to exploit the deposit, including the American Asbestos Company, American Asbestos and Manufacturing Company, Pacific Asbestos Corporation, and the Asbestos Producing Company of California (Logan and Franke, 1936, p. 226). In 1927 Harry Leach of Oakland and others leased the property. However, work ceased shortly afterward. During these earlier operations the property was known as the Voorhees deposit. In 1944 it was diamond drilled by the Johns-Manville Asbestos Corporation. In 1952 the deposit was acquired by the American Asbestos Mining Corporation of New York City. Some exploration work was done, and a 30-ton bulk sample was sent to a mill for testing.

The Jefferson Lake Sulphur Company obtained control of the property in 1959 and began an extensive exploration and development program. Exploration work has consisted of 15,000 linear feet of surface trenching and the sinking of 70 diamond drill holes to an average depth of 453 feet at the corners of 150-foot squares. Cores were milled at a pilot mill erected by the company at Copperopolis and at a custom laboratory in Quebec, Canada. Construction of a 2500-ton per day mill began in the Spring of 1961. It includes primary and secondary crushers, screens, conveyor belts, and drying equipment. Also stripping of overburden was continuing preparatory to open-pit mining.

This deposit is in a large mass of serpentinized peridotite, as shown on the geologic map of the Copperopolis quadrangle (Taliaferro and Solari, 1948, plate I). The asbestos forms stockworks of cross-fiber seams and veinlets in massive pale-green serpentine. Most of the fibers range from one-sixteenth to a quarter of an inch in length; a very small percentage of the fiber is half an inch or more in length (Salem J. Rice, personal communication, 1960). Exploration work by the present owner has indicated an estimated 17,000,000 tons of asbestos-bearing rock with the following fiber content (*Mining World*, May 1961, p. 17):

Group fiber	*Percentage yield*	*Percentage proportion*	*Tons of fiber*
4	1.0	16.0	170,000
5	1.5	24.0	255,000
7	3.8	60.0	646,000
Totals	6.3	100.0	1,071,000

The ore body, which is lensoid, is reported to be 2000 feet in length and to average 340 feet in width. It strikes N. 45° W. The highest-grade material is in the center of the deposit. The ore is relatively free milling. The company plans to save the fibers from the few wide veins with the coarser fibers to increase the quantity of medium-length material.

Turner and Lloyd deposit

Location: sec. 15, T. 2 N., R. 12 E., M.D.M., 4 miles due north of Copperopolis. Ownership: Max Henley et al., Copperopolis, California.

This asbestos deposit consists of a number of claims, including the Turner and Lloyd, which were originally prospected years ago (Logan, 1925, p. 164), and the Skipper claim, which was located by Max Henley in 1953. Some work was done on the property, and a small stockpile was made, which remains by the junction of the dirt road leading to the deposit with State Highway 4.

Chrysotile asbestos forms stockworks of small cross-fiber seams and veinlets in a heavily overgrown area at least 100 acres in extent. However, the percentage of

asbestos present in most places in the area is extremely low. The host rock is light green massive serpentine. The fibers usually are less than a quarter of an inch in length. The deposit is developed by numerous small open pits, open cuts, and—in the northwest portion—an open west-crosscut adit.

Barite

Barite is commonly found as a gangue mineral in the Foothill copper-zinc ores in Calaveras County, but there has been no commercial production. At one time, unsuccessful experiments were made on samples from the Napoleon copper mine in an effort to produce barite of sufficient purity for commercial use (Logan, 1925, p. 165). Minor amounts of barite also are present in some of the gold ores of the Mother Lode.

Chromite

Since 1904, Calaveras County has yielded 8,036 tons of chromite valued at $216,836. Most of this output was during World War I, the peak year having been 1918, when 3,830 tons valued at $159,453 were produced (U.S. Bureau of Mines records). Chromite mined prior to World War I was used for furnace linings in copper smelters. The estimated chromite reserves of the county are small, inasmuch as many of the mines are reported to have been exhausted (Cater, 1948, p. 40). Any future chromite production will probably depend upon new discoveries. The most favorable area for prospecting in Calaveras County is believed to be in the French Creek area, 5 miles southeast of Copperopolis (Cater, 1948, p. 40). In 1958 the only active property was the Alta mine. During World War II the chromite deposits in this county were studied by the U.S. Geological Survey. The results of this work were published in California Division of Mines Bulletin 134, Part III, Chapter 2, 1948.

Chromite is present as magmatic segregations in ultrabasic igneous rocks, especially serpentine. Serpentine crops out in three belts in western Calaveras County (see figs. 15, 16). The belts, which trend north-northwest, are not continuous, but consist of a series of irregular lenticular bodies.

Most of the chromite deposits are irregular lenses or pods of massive chromite, or thin, alternating layers of chromite and dunite. Relatively few disseminated chromite deposits have been found. In some of the deposits, small amounts of the secondary chromium minerals uvarovite (calcium-chromium garnet) and kammererite (chromium-mica) are present.

Alta mine

Location: SW¼ sec. 14 and NW¼ sec. 23, T. 2 N., R. 12 E., M.D.M., 3 miles northeast of Copperopolis. Ownership: C. H. Williams, Bert Satterlee, and Otto Cloward, 632 11th Street, Modesto, California.

This property consists of four unpatented claims that in 1958 were being prospected by a partnership consisting of the above three persons. Underground and surface development work was being done, and a small amount of ore had been stockpiled. Some chromite was mined here many years ago and used as furnace lining at the Copperopolis smelter. The property was prospected in World War I and again in World War II, but the output, if any, is not known.

A number of small discontinuous chromite lenses, pods, and small layers of disseminated chromite are present in a wide northwest-striking belt of serpentine, along with dunite and small amounts of impure tremolite asbestos. The serpentine is highly sheared in places and ranges from dark green to black in color. The ore bodies have a N. 45° W. to N. 55° W. strike and dip steeply to the northeast. Present work is confined to the northwest portion of the property where there is a 45-foot vertical shaft and a 35-foot northwest drift at the bottom of the shaft. There is a lens of chromite 3 feet long and a few inches thick exposed in the drift. There is an open cut 1500 feet to the southeast and another 300 feet to the northeast. Approximately 2,200 feet southeast of the shaft are old workings mined years ago, consisting of open cuts and a caved crosscut adit.

Bowie Estate deposits

In addition to the Holbrook and McGuire group, there are a number of other chromite deposits on the Bowie Estate. These deposits are in secs. 9 and 16, T. 1 N., R. 13 E., M.D.M., 6 miles southeast of Copperopolis.

Cater (1948, p. 44-45) has described in detail the known chromite deposits on the Bowie Estate. He also states that with intensive prospecting, in the serpentine area covered by almost impenetrable brush, possibly more deposits could be found. The total production of the property is probably not less than 400 long tons.

One chromite deposit located on the Bowie Estate in sec. 9, T. 1 N., R. 13 E., M.D.M., was active during 1918 and again in 1942. In 1942 about 15 long tons of chromite were mined and shipped. Although the total production of the mine is not known, the size of the workings indicates that perhaps 100 tons of ore had been mined (Cater, 1948, p. 44). The chromite ore body is irregular, strikes N. 30° W., and dips 25° to 45° NE. Workings consist of a 10-foot shaft, and an inclined open cut 45 feet long and 15 feet deep.

In 1942, about two carloads of chromite were mined from a deposit half way up the slope of the hill about 1200 feet southwest of the workings described above. Workings consist of an open pit 30 feet long and 30 feet deep. The ore consisted of brecciated massive and nearly massive medium-grained chromite containing numerous seams of uvarovite.

Ellingwood mine

Location: NW¼ sec. 21, T. 4 N., R. 11 E., M.D.M., 3 airline miles southwest of Valley Springs. Ownership: City of Stockton (1948).

This property first was worked in 1910 by the Penn Copper Company when chromite was used for furnace linings in their copper smelter at Campo Seco. The mine

was active during World War I and again in 1941 when a small amount of chromite was mined and shipped, but it has been idle since. Total production has amounted to about 500 tons of ore containing 38 percent chromic oxide (Cater, 1948, p. 49). Reserves are not known.

The chromite ore body is a vertical lens which has a strike of N. 35° W. (Cater, 1948, p. 49). This deposit is located within 150 feet of a contact of serpentine and metamorphic rocks of Jurassic age. Some kammererite is present at the deposit. Old workings include two open pits, two adits, and a winze. The larger pit is 85 feet long, 10 to 20 feet wide, and 15 feet deep. Two flooded shafts are located about 1000 feet to the southeast.

Holbrook and McGuire mine

Location: NE¼ sec. 8 and NW¼ sec. 9, T. 1 N., R. 13 E., M.D.M., 4½ airline miles southeast of Copperopolis. Ownership: Bowie Estate, Copperopolis, California.

This property first was worked during the early 1890s and chromite was shipped to the copper smelter at Campo Seco. The mine was active again in 1918, when a small mill was erected and several hundred tons of chromite concentrated. Some work was done on the property in 1942 by Charles Hunter and Allan Dunbar, but it has been idle since.

There are two deposits known as the low-grade and the high-grade deposits. Chromite from the low-grade deposit, (in SW¼ NW¼ sec. 9), was mined by a glory hole and open cuts for a length of 200 feet along the strike. It consists of a zone of vertical lenses striking N. 45° W. The individual lenses are as much as 20 feet long and 6 feet thick. The ore from this deposit contained about 20 percent chromic oxide. A 125-foot northeast-bearing tunnel is connected to the glory hole.

The high-grade deposit is about 1000 feet northwest of the low-grade deposit. Chromite is in northwest-striking pods ranging from 1 to 4 feet in thickness and as much as 10 feet in length. Workings consist of a 95-foot inclined shaft, a small open cut, and a 15-foot shaft. Another shaft, now caved, lies about 1000 feet to the southwest. Nearly 800 feet southwest of this shaft is an open cut.

Madrid (True Blue) mine

Location: SW¼ sec. 2, T. 3 N., R. 13 E., M.D.M., half a mile south of San Domingo Creek and 2½ miles west of Murphys. Ownership: Adolph Genochio, Murphys, California.

The Madrid mine was worked from 1916 to 1918 by John Madrid and 982 long tons of chromite were produced (Cater, 1948, p. 57). It lay idle until 1942-43 when the present owner mined 57 long tons of chrome ore. The mine has been idle since 1943.

The ore body is an irregular, broken lens of nearly massive and disseminated chromite that strikes N. 80° W. and dips 65° SW. The maximum thickness of the lens is 12 feet, but its length is not known. Country rock consists of schistose altered serpentine. Chromic oxide content of the ore shipped was about 30 percent (Cater, 1948, p. 57). Workings include an open pit 45 feet long, 45 feet wide and 15 feet deep, and a 25-foot inclined shaft located in the bottom of the pit.

Mayflower (Burnham and Wilson) mine

Location: NW¼ sec. 9, T. 1 N., R. 13 E., M.D.M., 5 airline miles southeast of Copperopolis. Ownership: not determined.

This chromite mine was first operated by W. A. Burnham and F. A. Wilson during World War I. In 1941 the mine was reopened by C. A. Gillis and 74 tons of ore were mined (Cater, 1948, p. 42). Some exploratory work was done by Charles Hunter in 1942, but the mine has been idle since. The property is credited with a recorded output of 667 long tons of chromite which contained about 48 percent chromic oxide.

Chromite is in lenses 1 to 4 feet thick enclosed in highly sheared serpentine. Talc and kammererite are associated with the chromite. Old workings include a 15-foot shaft, an open cut 45 feet long and 40 feet deep, and a caved 100-foot adit that apparently was connected to the bottom of the open cut.

Walker (Bushy Hill, Chaparral) mine

Location: E½ sec. 15, T. 2 N., R. 12 E., M.D.M., near the head of a gulch tributary to Black Creek, 3½ miles north of Copperopolis. Ownership: B. C. Creswell (1948).

This chromite mine was worked originally during World War I by F. G. Walker and C. A. Gillis. A total of 71 long tons of ore containing approximately 40 percent chromic oxide was produced (Cater, 1948, p. 42). It was prospected in 1940 by B. W. Cresswell, but apparently has been idle since. A small amount of asbestos and chrome prospecting has been done recently west of the mine.

The deposit is near the east margin of a serpentine body. The ore body consists of a 2-foot-thick lens of chromite with associated disseminated chromite in highly sheared light-green serpentine. Granodiorite lies to the east, and in the vicinity of the deposit there are diorite dikes and some dunite. To the west of the deposit the serpentine contains some asbestos. The mine is developed by a main 60-foot shaft now caved, and two other shallower shafts, 200 and 2000 feet to the southeast.

Clay

For many years clay from the Ione formation has been mined in the vicinity of Valley Springs. The chief operation has been at the Valley Springs pit of the California Pottery Company. Years ago clay was produced at several other pits in the area and to the west, and at one time kaolinized sericite schist was mined at Campo Seco and used as a refractory at the copper smelter.

The Eocene Ione formation, the major source of raw material for the ceramic industry in northern California, crops out in a belt of discontinuous patches along the western Sierran foothills. The most extensive exposures

extend from northeastern Sacramento County across western Amador County to the extreme northwest corner of Calaveras County. In Calaveras County the Ione formation covers an area of approximately 4 square miles. It has been divided into an upper and a lower member. The upper member, consisting of clayey sand and some clay, is mined for silica sand at Camanche (see chapter on silica) and at Ione in Amador County.

The lower member, consisting of clay and clayey sand, is the main source of commercial clay. The clay minerals are kaolinite ($Al_2O_3.2SiO_2.2H_2O$) and anauxite ($Al_2O_3.3SiO_2.2H_2O$). Individual crystals of kaolinite are too fine-grained to be seen with the naked eye, but pearly flakes of anauxite are easily distinguishable. It is classified as fire clay, but most of the county's output is used as common clay, as in the manufacture of drain tile and sewer pipe.

Valley Springs pit

Location: S½ sec. 13, T. 4 N., R. 10 E., M.D.M., a quarter of a mile northeast of Valley Springs. Ownership: California Pottery Company, Niles, California; Henry Ward, pit foreman.

This clay deposit originally was worked about 1888 (Henry Ward, personal communication, 1954). Since 1916, fire clay has been mined from the pit during the summer and trucked to Niles in the San Francisco Bay area for use in the manufacture of sewer pipe and drain tile. The pit is in operation for about 35 days a year, usually in May and June. Annual output ranges from 3500 to 4000 tons (Henry Ward, personal communication, 1954). The property is about 17 acres in extent.

The clay is part of the Ione formation, which in this area crops out in two patches in and to the north of Valley Springs and to the east. It is overlain to the north and west by the Valley Springs formation. The Ione beds are nearly horizontal and at least 50 feet thick in this area (Dietrich, 1928, p. 69). There are several varieties of clay in this deposit, white, mottled red and white or pink, and light yellow clay. The different varieties of clay are somewhat intermingled, but the white and pinkish clays are more abundant in the south portion of the deposit, and the yellowish variety predominates in the north. Small sandy lenses are scattered throughout the clay, and there are limonitic streaks that occupy small but numerous fractures. Tests made on two samples from this pit were reported as follows (Dietrich, 1928, p. 337): The "pink mottled" clay is red burning, has a smooth and strong plasticity, a medium dry strength, and is excellent as a base brick and roofing tile clay; the "yellow plastic" clay is similar in its ceramic properties to the "pink mottled" clay but not so fine grained and contains more plastic matter.

The pit is about 250 yards long in a northerly direction, 125 yards wide, and ranges from a few feet to 30 feet in depth, the highest pit face being on the west side. The clay is loosened by auger drilling and blasting, and is loaded into end-dump trucks for shipment. At the Niles plant the Valley Springs clay is mixed with clays from Ione, Amador County, and local clays in the proportion of sixteen parts Niles clay, six parts Valley Springs clay, and two parts Ione Bacon No. 2 clay for the production of sewer pipe. When active, two men (including Mr. Ward) work at the pit.

Cobalt

Cobalt has been found in several prospects in Calaveras County. However, there has been no recorded production. Cobalt is of strategic importance because of its use in high-temperature alloys, high-speed steels, and in the chemical industry.

Between 1923 and 1930, small amounts of smaltite ($CoAs_3$) were recovered from a prospect at the Mar John gold mine north of Murphys (Logan, 1925, p. 142, and Logan and Franke, 1936, p. 274). A few tons of material were mined but apparently never marketed. Asbolite, a cobalt-bearing wad, was found at the Casey and Bach claim, 1 mile east of Mokelumne Hill (Logan, 1925, p. 142). Cobaltite has been observed at a few of the mines in the Foothill copper belt.

Copper-zinc

Calaveras County has been the principal source of copper and zinc in the Sierran Foothill copper belt. Smaller amounts have been recovered as a by-product of gold mining. The recorded copper output of Calaveras County since 1880 has been 129,704,205 pounds valued at $21,064,118.

Copper in the Foothill belt was discovered in 1860 at what is now the Quail Hill mine (Heyl, 1948c, p. 13). Soon afterward, the copper lodes at Copperopolis and Campo Seco were discovered, and the copper "boom" of the Civil War was in full sway. Smelters were erected and, by 1866, more than 5 million dollars worth of copper ore had been mined. The Union mine at Copperopolis was the source of more than half this production. By 1867, a fall in the price of copper had ended the boom. From about 1880 to the end of World War I, the copper mines of Calaveras County were intermittently active. Most of the mines were inactive during the 1920s and 1930s.

During World War II, copper mining in Calaveras County was revived on a major scale, and a considerable amount of by-product lead and some gold and silver were recovered. This area also became a major source of zinc for the first time. Zinc had been produced as a by-product as early as 1906, but ore-dressing techniques had not been developed to the point where zinc-bearing copper ores could be economically treated. During the period of 1942-45, the principal Foothill mines in Calaveras County were the source of 814,744 tons of ore that yielded 15,254,946 pounds of copper, 15,546,741 pounds of zinc, 832,113 pounds of lead, 9,164 ounces of gold, and 273,833 ounces of silver (Heyl, 1948, p. 14). Since World War II, there has been some activity at the Union and Keystone mines. Also, a considerable amount of zinc was produced at the Penn mine between 1948 and 1953.

In May 1958 small amounts of cement copper were being produced from the Penn, Star-Excelsior and Union mines.

The Foothill copper-zinc ore deposits are for the most part lenticular sulfide ore bodies developed by replacement along zones of faulting, shearing, and crushing. The ore bodies consist of pyrite containing chalcopyrite, sphalerite, and smaller amounts of galena, tetrahedrite, bornite, gold, and silver. Other minerals that are present include pyrrhotite, quartz, calcite, barite, chlorite, magnetite, and hematite. In a few deposits, cobaltite, ilmenite, rutile, and sphene have been observed (Heyl, 1948c, p. 20). Outcrops of the ore bodies usually are marked by gossan caps, some of which have been profitably mined for gold. The gossan usually does not extend to depths of more than 30 or 40 feet. The zone of supergene enrichment in most deposits of the Foothill belt ranges from within 20 to 60 feet of the surface. Chalcocite, the most plentiful secondary sulfide, is accompanied by smaller amounts of covellite.

Copper and zinc minerals are also minor constituents of lode gold ores in the Mother Lode and East Belt deposits, and copper minerals are found in tactite at the Garnet Hill and Moore Creek tungsten mines.

Collier mine

Location: W½ sec. 24, T. 1 N., R. 11 E., M.D.M., 6 miles southwest of Copperopolis and half a mile southeast of the Napoleon mine. Ownership: Mrs. Violet Likens, P. O. Box 31, Belvedere, California.

The Collier copper mine has a total recorded production of more than 5700 tons of ore. The claim was taken up by F. Collier late in January 1861. At shallow depths, he took out rich copper-carbonate ore containing nuggets of gold. Wire silver was encountered in the shaft at a depth of 30 feet. By late 1863, a second shaft had been sunk and an undetermined amount of ore was shipped (Mining and Scientific Press, Nov. 9, 1863, p. 2). The mine was patented in 1877. No further activity was reported until 1917, when a pocket of gold ore was found in a shallow shaft. In 1918, two carloads of complex copper ore were shipped at a loss. The mine was reopened again in 1940, when 68 tons of ore were shipped.

In 1943-44, lessees, including J. B. Rica and E. A. Vogt of San Francisco, mined 5,613 tons of ore containing 8¾ to 13½ percent zinc, 3 to 5 ounces of silver, and minor amounts of gold, lead, and copper. After production ceased, the U. S. Bureau of Mines drilled four holes totaling 1,355 feet without finding ore (Heyl, 1948, p. 125).

The Collier ore body is a thin replacement lens developed in a fault zone close to the contact between intrusive quartz porphyry and green schist. The ore has formed along a low-dipping portion of a footwall fault that dips 44° to 70° E. Many minor faults have disrupted the lens, which plunges about 43° N. The ore consists of chalcopyrite, sphalerite, and pyrite; there is a minor amount of chalcocite above the 56-foot level. Considerable galena is present in places. Barite is an abundant gangue mineral. Underground workings consist of an open shaft inclined 51° NE., with levels at 56, 124, and 167 feet. Ore was stoped on both sides of the shaft between the 56- and 124-foot levels.

Copperopolis mines

Location: Sec. 34, T. 2 N., R. 12 E., secs. 3 and 2, T. 1 N., R. 12 E., M.D.M., in the vicinity of Copperopolis. Ownership: Calaveras Consolidated Mining Co., Ltd., 801 Bank of America Building, San Jose, California.

The Copperopolis mines consist of the North Keystone, Keystone-Union, Empire, and Jackson McCarthy (Old Calaveras) mines, from north to south, and the Calaveras mine west of the Union. These mines have yielded a total of at least 36,300 tons of copper metal, and have been among the most prominent sources of copper in California since their discovery in 1861. The Union mine was the foremost producer of copper in the 1860s, and the North Keystone ranked second in California production during World War II.

In July 1860, William K. Reed discovered a copper lode at the present site of Copperopolis. When the importance of the Reed lode became known, prospectors rushed into the area and staked claims along more than 2 miles of its length. The Union mine was a profitable operation from the very first. By April 1866, the main Union shaft had reached a vertical depth of 480 feet, and there were seven levels. The main Keystone shaft had been sunk 360 feet down a steeply dipping vein, and had four levels (Mining and Scientific Press, April 21, 1866, p. 250-51). Between 1864 and 1866, the Keystone mine operated a concentrating plant, and the Union Copper Company used a crude smelter, to improve the lower-grade ores for shipping. Both operations were abandoned when they proved to be unprofitable.

In 1867 the Copperopolis mines closed down because of a fall in the price of copper. The Union Copper Mining Company smelter was operated in 1869, the mine itself resumed production briefly in 1871, and part of the surface dumps were roasted and leached in 1872 (Mining and Scientific Press, Nov. 11, 1871, p. 292; Oct. 5, 1872, p. 212). Except for these activities and routine maintenance work, the Copperopolis mines were inactive from December 1867 to 1887. In June of that year, dewatering of the Union mine began. Production was renewed in January 1888 and lasted until 1892, during which time a new smelter was installed, and the Union shaft was sunk to 800 feet.

Since 1878, the Keystone and Union mines had been held by the same owner. These mines were operated as a unit through the Union shaft beginning in 1900, when dewatering of the combined workings began. Ore was produced from 1902 to 1909, and intermittently from 1911 to 1920. A concentrating mill, in which the ore was crushed, sized, jigged, and tabled, was in use as early as 1907 (Aubury, 1908). In August 1909, the property was acquired by the Calaveras Copper Company. The Keystone-Union was operated through the Keystone shaft in

the years 1923-27 and 1929-30. During this last period of activity, the Engels Copper Company (lessee) sank a 675-foot vertical shaft northwest of the old workings, in order to develop a new part of the vein in the North Keystone mine.

In 1942, the owners of the North Keystone mine, Calaveras Consolidated Mining Co., Ltd., leased it to the Keystone Copper Company. In July 1943, the Keystone Copper Corporation was formed by the Lava Cap Gold Mining Corporation and the Keystone Copper Company to operate the property. Under this new lease, ore was produced from the North Keystone between July 1943 and July 1945. It was concentrated to a grade of 26-28 percent copper by selective floatation at the Mountain King mill. During 1944-46, the Pacific Mining Company reworked the old Keystone-Union tailings in a grinding-flotation unit. In February 1956, a subsidiary of the Daybreak Uranium Company of Spokane, Washington, began dewatering the South Union shaft, in an attempt to recover copper from the mine water. In May 1958, cement copper was being produced by Copperopolis Mines, Inc. from the Union shaft.

The North Keystone mine is developed in the northern end of the Keystone claim. Its main shaft was 600 feet deep in 1906, and by 1942 had been sunk to 690 feet. In 1943 and 1944 it was sunk further to 1,115 feet, and a crosscut on the 875-foot level was driven 270 feet eastward. More than 400 feet of drifts were opened south of the crosscut, and 260 feet were opened north of it. Two 17-foot-wide shrinkage stopes were mined south of the crosscut. The North Keystone closed down in 1945 and has been idle since.

The Empire mine adjoins the Union mine to the south. It was active in December 1862, and produced ore from 1865 through 1867, although no record of the amount is available. The main shaft was 110 feet deep in October 1863 (Mining and Scientific press, Oct. 26, 1863, p. 1). Southeast of the shaft is the Empire tunnel, which trends southwest and is about 420 feet long. This property was acquired by the Union Copper Mining Company prior to 1908.

The Jackson McCarthy (Old Calaveras) mine adjoins the Empire on the south. It consists of two shafts, one of which is 250 feet deep (Aubury, 1902, p. 198), and a stope between them. There is no record of production from this mine.

The Calaveras mine is the second western extension of the Union. This property was worked in 1862, and ore was shipped in 1863, at which time the main shaft was 110 feet deep. The last recorded activity was in October 1863.

Other nearby claims, including the Inimitable, Kentucky, and Consolidated, have sketchy histories of brief activity in the 1860s, but no recorded production.

Reported production from the Copperopolis mines totals 1,188,906 tons of ore and 491,840 tons of reworked tailings (Heyl, 1948, p. 96-97). The Keystone mine yielded 1,087 short tons of copper metal from 1861 to 1867, and the Union yielded 10,884 tons from 1861 to 1889. More than 19,329 tons of copper, 28,945 ounces of silver, and 317 ounces of gold were produced from the Keystone-Union mine in the period 1890-1946. Production from the North Keystone amounted to 4,999 tons of copper, 8,553 ounces of silver, and 175 ounces of gold in the years 1942-45.

Blue-gray schist and volcanic greenstone of the Copperopolis area have been tentatively correlated with the Jurassic Amador group (Heyl, 1948, p. 99). These rocks have been intruded by dikes, lenses, and elongate bodies of basic and granitic rocks, (now crushed, sheared, and altered) which are broadly concordant with the foliation of the enclosing metamorphic rocks. Granodiorite, which forms several bodies of moderate size, contains chlorite, epidote, sericite, calcite, and leucoxene as products of alteration. The rock commonly is cut by quartz-albite and quartz-calcite-epidote veinlets. Chlorite is especially abundant in crushed zones in the granodiorite, and, near the ore bodies, introduced pyrite is common. Chalcopyrite is in veinlets or as disseminated grains.

The regional strike of the rocks near Copperopolis is N. 42° W., and bedding, cleavage, and schistosity all dip steeply to the northeast. Bedding and folation generally are parallel, but locally are divergent. Isoclinical folding of metamorphic rocks in the area is indicated (Heyl, 1948, p. 100). A narrow fault zone, approximately parallel to the regional strike, dips steeply northeast. It includes two major en echelon faults. The northeastern of these is the Footwall fault, and the other is the Calaveras fault.

A discontinuous belt of intense chloritization, 9000 feet long and up to 300 feet wide, follows the fault zone. Chloritization crosscuts lithologic contacts and affects greenstone, slate, granodiorite, and, to a lesser degree, hornblendite and serpentine. Intense sericitization, a minor feature in the mineralized belt, is restricted to regions of intense shearing and crushing, where it is associated with quartz and abundant disseminated pyrite. This mineral association is observed only near the ore bodies, and generally in the hanging wall (Heyl, 1948, p. 101). Coarse grains of disseminated pyrite are abundant in envelopes around the ore bodies. Finely disseminated magnetite, generally associated with talc, is the gouge and walls of many fault zones in the mineralized region.

Empire mine. Copper mineralization at the Empire mine is most strongly developed along the steeply dipping Calaveras fault or in its hanging wall. The zone of chloritization follows the Calaveras fault, generally in the hanging wall, and a small elongate body of serpentine forms part of the footwall. Elsewhere, this fault is bounded on both sides by metavolcanic rocks. Disseminated pyrite is widespread, and small amounts of malachite and cuprite locally are common. Along a narrow zone in hornblendite, 175 feet from the entrance to the Empire tunnel, scattered grains of chalcopyrite are found with disseminated pyrite. Heyl (1948, p. 109) was unable to find any large quantity of copper ore in this tunnel.

Photo 7. Surface plont of the Keystone-Union copper mine, Copperopolis district. Comero facing northeost. *Phato by Mary Hill.*

Jackson McCarthy (Old Calaveras) mine. Workings accessible in the 1940s were entirely within the zone of oxidation (Heyl, 1948, p. 109). Mineralization follows a zone of crushing and shearing along the southwest side of a small fault that is 25 feet east of, and related to, the Calaveras fault. This small fault dips steeply east on the surface, but in the underground workings it reverses itself and assumes a steep west dip. Thin streaks of chloritized rock are found in the footwall within 4 feet of the fault. Ore minerals found in the mine include malachite, cuprite, azurite, chalcanthite, and, in the lower portions of the workings, chalcopyrite. Pyrite and limonite are common.

Keystone-Union mine. An elongate body of serpentine forms the footwall of a steep, east-dipping fault, continuous with the Footwall fault of the North Keystone mine. The hanging wall of the fault is a zone of intense chloritization. The serpentine body is 1,730 feet long and is parallel to a moderately large granodiorite intrusion 100 feet to the west. Both these masses are concordant with the regional strike. Throughout most of the mine, the footwall of the mineralized zone is serpentine and talc, whereas the hanging wall is greenstone, slate, and granodiorite (Heyl, 1948a, p. 108).

Ore bodies in the Keystone-Union mine are restricted to the zone of chloritization. Dump material indicates that they consist of anastomosing veinlets and irregular masses of chalcopyrite and pyrite. They are in lenticular masses parallel to the foliation of enclosing rocks, but without systematic arrangement when viewed in plan (Heyl, 1948, pl. 38). Assay data indicate that the ore shoots have a steep north rake and vague boundaries. Some attain a maximum width of 33 feet, a strike length of 350 feet,

Photo 8. South shoft of the Keystone-Union capper mine, and the heodfrome ond surface plant, Copperopolis district. Comera focing north.

and a pitch length of at least 600 feet. The ore grade ranges from about 1 to 18 percent copper.

The Keystone-Union workings consist of six shafts and 15 levels developed along 2000 feet of the mineralized zone. A depth of 1,350 feet is attained by the lowest level. The two principal shafts, once the means of access to separate mines, are the Keystone-Discovery and Union No. 1.

North Keystone mine. The Footwall fault forms the footwall of the zone of chloritization that contains the ore bodies in this mine. Its dip ranges from 45° to 78° NE., but averages 62° to 72°, and the strike has a maximum variation of 15°. The larger ore bodies are parallel to those segments having the more northerly strike. The Footwall fault is marked by a well-developed gouge that generally is between 1 and 20 inches wide.

Granodiorite, even where crushed and thoroughly chloritized, was a less favorable environment for replacement by copper-bearing minerals than adjacent chloritized schist and slate. Thus, copper deposits in granodiorite are lean and in many places give way to streaks of pyrite or barren rock. On the surface, the chloritized zone in which the ore bodies are found is seen to narrow and pinch out at the south end of the mine.

The ore bodies are lenticular sulfide-replacement deposits that are concordant with the foliation of the enclosing rock; their major axes are parallel to the dip of the fault. In detail, these lenses consist of numerous anastomosing veinlets of chalcopyrite and pyrite in chloritized schist, slate, or granodiorite. Streaks and veins of massive sulfides, some up to 2 feet in width, also are present in the ore bodies. Chalcopyrite and pyrite are, in many places, intimately intergrown. The ore tenor ranges from 1½ to 9 percent copper, with very little gold or silver. Bornite is rare, and ilmenite, sphene, rutile, and andalusite are formed locally. Gangue minerals include epidote, hematite, jasper, and veinlets of white quartz and calcite.

Three principal ore bodies are in the North Keystone mine. They are en echelon in plan, each lying east of its northern neighbor. The North ore body has a strike length of 360 feet, a maximum width of 20 feet, and a depth of at least 550 feet. The Middle ore body has a strike length of 240 feet and a maximum width of 20 feet. It extends downward for about 525 feet from a depth of 300 feet. It is absent on the 875-foot level, but on its downward projection at the 1075-foot level, a 7½-foot-wide lens of ore is present. The South ore body is 285 feet long, at least 650 feet deep, and as much as 15 feet wide.

During 1943, a drilling program by the U. S. Bureau of Mines located 11,000 tons of rock containing 3.0 percent copper in a 3-foot-wide zone immediately north of the mine workings (Heyl, 1948, p. 106).

The North Keystone mine is developed by a three-compartment vertical shaft, 1,115 feet deep, with levels at 150, 375, 525, 675, 875, and 1,075 feet. More than 3,200 feet of drifts have been advanced along the strike on both sides of the shaft.

Napoleon mine

Location: NE¼ sec. 23, T. 1 N., R. 11 E., M.D.M., 6 miles southwest of Copperopolis and 1 mile southeast of Telegraph City. Ownership: E. A. Nutter et al., P. O. Box 187, Saratoga, California.

The Napoleon mine—discovered in December, 1860—is one of the oldest known major copper mines in California. By 1927 it had a reported total production of $1.2 million worth of copper and silver (Neale, 1927, p. 509).

This mine was worked at least as early as the first part of 1861. In 1862, a yield of 200 tons of ore per month from a shaft 45 feet deep was reported (Mining and Scientific Press, Dec. 29, 1862, p. 2). Only half of this ore, said to average 14-20 percent copper, was shipped. The Napoleon remained active until late in 1865, when the Hughes mine adjacent to it was assimilated, and work was suspended during the ensuing reorganization. One source (Aubury, 1902) states that the mine filled with water and was not reopened until a new shaft was sunk in 1900, although some copper was recovered by a leaching process in 1877. Tucker (1916, p. 58), on the other hand, reports that 1600 tons of ore were shipped in 1881. This ore was reported to have averaged 11.25 percent copper, 0.26 ounces gold, and 5.7 ounces silver. Cement copper was produced by leaching the old dumps from 1900 to 1915, and some ore was shipped to the Peyton Chemical Works (Stevens, 1911). The workings reached their maximum depth, 430 feet, prior to 1908 (Aubury, 1908).

In 1918, new milling and flotation equipment having a capacity of 90 tons per day was installed on the property. A small production was made the following year, but thereafter the mine was again allowed to fill with water. In 1926, the main shaft was dewatered to a depth of 200 feet, but no production was reported (Neale, 1927, p. 509). The next activity was in 1942-43, when Mountain Copper Co., Ltd., rehabilitated a 280-foot vertical shaft and drilled 10 test holes on the 250-foot level (Heyl, 1948).

Old records of the mine indicate that three irregularly lenticular ore bodies that pitched 65° to 70° E. were mined (Heyl, 1948). The largest of these was reported to have been 60 to 70 feet long, 6 to 20 feet wide, and mined to a depth of 250 feet or more. The two smaller lenses were below this body and between the 250- and 375-foot levels.

The mineralized area of the Napoleon mine is a shear zone in a large mass of intrusive quartz porphyry and felsite, near the contact of this rock with a narrow belt of east-trending metavolcanic greenschists, which appear to be roof pendants. The shear zone strikes N. 75° W., and dips 65° to 75° SW. Considerable sericite has formed in the shear zone, and lesser amounts in adjacent rocks. The ore is a replacement type consisting of chalcopyrite, sphalerite, pyrite, and galena, with a gangue of barite, calcite, and quartz. Appreciable amounts of gold and silver are present. Copper carbonates and oxides were of importance in the early life of the mine.

The principal workings of the Napoleon mine consist of three shafts, two of which are caved, and four main levels, at 100, 250, 300, and 375 feet. The workings, most of which have been inaccessible since 1919, reach a maximum depth of about 430 feet. Drifts on the main levels extend generally east and west from the shafts, and all are 200 to 300 feet in length.

Nassau (Goat Ranch, Pool) mine

Location: NE¼ sec. 9, S½ NW¼ sec. 10, T. 2 N., R. 12 E., M.D.M., 5 miles due north of Copperopolis. Ownership: C. J. Tiscornia, San Andreas, California.

The Nassau copper mine, consisting of the Goat Ranch and Goat Ranch Extension claims, was worked by A. S. Pool prior to 1900. This property was acquired by the Nassau Copper Company in the early 1900s, and by 1908 the company had sunk a 300-foot shaft and reportedly had mined $70,000 worth of copper ore (Aubury, 1908, p. 245). The mine was operated intermittently through 1919. There is no record of further activity until 1941, when the shaft was dewatered (Eric, 1948, p. 221). No production resulting from this operation is known.

Ore bodies in this mine are parallel high-grade lenses ranging from a few inches to 2 feet in thickness in a narrow body of metadiabase. The footwall is slate, and the hanging wall is diorite. Unoxidized ore, found within 30 feet of the surface, consists of chalcopyrite associated with pyrite, minor amounts of gold and silver, and as much as 18 percent zinc, as sphalerite. Shipping ore contained an average of about 0.2 ounces gold, 4.6 ounces silver, 5.2 percent copper, and 17.9 percent zinc (Tucker, 1916, p. 58). Precipitating tanks were used to produce copper cement from the mine water.

Mine workings consist of a 430-foot vertical shaft with levels at 95 and 200 feet. Drifts extend north 200 and 240 feet, and south 800 and 820 feet, on the upper and lower levels respectively. The shaft is open, but no equipment remains on the property.

Penn mine

Location: Secs. 3 and 4, T. 4 N., R. 10 E., and secs. 33 and 34, T. 5 N., R. 10 E., M.D.M., 1 mile west-northwest of Campo Seco and just south of the Mokelumne River. Ownership: see below.

The Penn mine has been one of the major sources of copper in the Sierran foothill belt and an important source of zinc, lead, gold, and silver. The property consists of a number of patented claims including the Campo Seco, Hecla, Little Satellite, and Satellite, which are owned by New Penn Mines, Inc., 123 William Street, New York 38, New York; the Constellation, Meteor Gold, and West Constellation, which are owned by the Constellation Mining Co., c/o Harriet B. Minahen, 4715 Opal Cliff Drive, Santa Cruz, California; the Blue Jay and Happy Jack, which are owned by John Ponzetto, 2831 North E Street, Stockton, California; and mill sites, a smelter site, and other lands.

Copper deposits in this area were discovered in 1861 (Browne, 1867, pp. 146-147). At that time, the claims were operated separately. In 1865, a smelter with an 8-ton Welsh-type furnace was erected on the property which yielded matte containing 35 percent copper. The properties were shut down around 1867 when the copper "boom" of the Civil War period ended.

From 1883 to 1886 the Lancha Plana claim, which was renamed the Satellite, was operated by H. D. Ranlett (Aubury, 1908, p. 239). An adit was driven to connect with the old shaft (Shaft No. 1), about 1000 tons of ore shipped, and dump material was leached. During this time, material from the dump of the Campo Seco mine was treated also by roasting and leaching at the Sunrise Placer Mining and Copper Reduction Works (Hanks, 1884, pp. 150-151). About 1886, the San Francisco Copper Company acquired the Satellite mine. In 1887, the Penn Chemical Company acquired the Campo Seco claim, dewatered the mine, and treated large quantities of ore by heap roasting and leaching (Irelan, 1888, p. 153). Later, this same company purchased the Satellite and Hecla mines, and adjoining properties; which were merged into what is known as the Penn mine. In 1896, dump material was still being leached (Crawford, 1896, p. 57).

In 1899 a smelter was erected and operated continuously until 1919. It was equipped with a crushing and grinding plant, eight roasting furnaces, and a blast furnace (Tucker, 1916, p. 61). A high-grade matte containing 50 to 60 percent copper was produced, which was crushed and shipped to New York for refining. Gross returns from the smelter operations, including gold and silver, were valued at $7,362,562 (Heyl, Cox, and Eric, 1948, p. 64). The smelter was shut down and dismantled when copper prices decreased following World War I. The Penn Mining Company continued underground development work until 1921, and the mine was kept dewatered until 1926 when it was sampled for the American Smelting and Refining Company.

In 1928, the mine was leased by the Mateo Mining Company, and Shaft No. 2 was dewatered to the 700-foot level. Only a small amount of ore was mined. In 1937, another similar short-lived project was undertaken by the Penn Copper and Zinc Company (Heyl, Cox, and Eric, 1948, p. 64).

From 1943 to 1946, the mine was operated on a major scale by the Eagle-Shawmut Mining Company. The ore was trucked 70 miles south to the Eagle-Shawmut mill near Chinese Camp, Tuolumne County. Copper-lead and zinc concentrates were produced and shipped to the smelter at Tooele, Utah. In July 1946, a new concern, the Shawmut Copper Mine Company, was formed and operated the mine until October 1947 (U. S. Bur. Mines Min. Yearbook, 1947, p. 1343). From November 1942 to February 1945, the mine was studied in detail by the U. S. Geological Survey, and results were published in California Division of Mines Bulletin 144, pp. 61-84 and plates 14-24 (Heyl, Cox, and Eric, 1948). Also in 1942, the U. S. Bureau of Mines sampled the slag dump and mine water, and the results were published in U. S. Bureau of Mines Report of Investigations 4224 (Wiebelt and Ricker,

Photo 9. Surface plant at the Penn copper-zinc mine in the vicinity of shaft No. 2; camera facing northeast. *Photo by Mary Hill.*

1948). In 1943, the Constellation claims were diamond drilled by the U. S. Bureau of Mines, but no material considered worth assaying was found (Heyl, Cox, and Eric, 1948, p. 65).

In 1948, a newly formed concern, the Penn Chemical Company, leased the property and commenced operations (Mining World, June 1952, p. 22). The upper levels were dewatered, and the mill was reconditioned. Zinc ore that had been by-passed in earlier operations was mined. Zinc and copper-lead concentrates and gold amalgam were produced. This operation continued until January 1953, when the mine was closed down. In the summer of 1953, New Penn Mines, Incorporated, was organized and obtained a DMEA loan to diamond drill for copper in the vicinity of Shaft No. 3. Some ore was found, but the main objective of the program was not accomplished, and operations ceased.

In the Fall of 1955 the property was leased by the Standard Mining Corporation of New York, William Hooten, manager. Shaft No. 3 was dewatered to the 400-foot level. Some crosscutting was done to the east and a small amount of ore mined. In 1958, the property was sub-leased to Kenneth Boyles of Valley Springs and later to P. R. and Henry Bradley. They suspended operations late in 1959.

In 1952, the total recorded output of the mine was 973,784 tons of ore which yielded 82,534,054 pounds of copper, 22,196,482 pounds of zinc, 1,225,798 pounds of lead, 67,772.65 ounces of gold, and 2,150,304 ounces of silver (Heyl, Cox, and Eric, 1948, p. 65, and U. S. Bureau of Mines Minerals Yearbooks, 1947-1952).

Rocks in the area of the Penn mine are Mariposa slate, metavolcanic rocks, and intrusives. Bedding strikes to the northwest, dips steeply to the northeast, and generally parallels the schistosity and cleavage. The metavolcanic rocks are part of the Amador group and consist of a thick sequence of rhyolite and andesitic tuff, felsite, basalt, and agglomerate. The chief intrusive rock is quartz porphyry in sills and lens-shaped bodies. Present in smaller amounts in this area are numerous quartz veins and intrusive rocks that have been designated as felsite, greenstone, and trap (Heyl, Cox, and Eric, 1948, p. 70). The ore bodies are lenticular sulfide replacement deposits in alteration zones of sericitization, silicification, and pyritization within the metavolcanic and intrusive rocks. Many of the nearby hills are capped by flat-lying Tertiary channel gravels.

Ore bodies at the Penn mine are mixtures of pyrite, chalcopyrite, and sphalerite with small amounts of bornite, galena, and some tetrahedrite. The ore bodies are lenticular in form, and the long axes plunge down-dip or steeply to the north or south. They vary considerably in size, some having been mined along the pitch length of as much as 1000 feet (Heyl, Cox, and Eric, 1948, p. 79). Also, the ratio of copper to zinc varies considerably. In the area of Shaft No. 3 the footwall of the ore zone contains abundant zinc, while copper and zinc are nearly equal in the hanging wall. Thickness of the ore bodies ranges from 4 to 30 feet. The sulfides are present in massive or banded form as well as in stringers, narrow irregular masses, or disseminated form. Most of the pyrite is fine grained. Chalcocite and covellite have been found in some of the upper levels. Barite intergrown with sulfides is locally abundant in some of the ore bodies. Quartz, calcite, selenite, and some native copper are present in the ore. Four ore controls have been recognized (1)

Photo. 10. Mill at the Penn mine February 20, 1955. Shaft No. 2 is in the background. *Photo by Mary Hill.*

Photo 11. Shoft No. 3, Penn copper-zinc mine, showing headfrome, ore bin, and wooden precipitation tonks used in the production of cement copper. Comero focing north.

belts of sericitization and silification; (2) areas of bowing and buckling normal to the schistosity; (3) intersections of high-angle schistosity faults with low-angle reverse faults; and (4) small, tight, and unsystematically oriented schistosity folds (Heyl, Cox, and Eric, 1948, pp. 81-82).

The mine is developed by at least 20 shafts, six of which are numbered, several adits, and numerous open pits and cuts. Plate 15 in the pocket of California Division of Mines Bulletin 144 contains a detailed geologic map of the Penn mine area and shows the locations of all the working entries. Plates 14 and 16 to 24 in Bulletin 144 contain detailed mine and geologic maps. The principal working entries have been Shafts No. 2, 3, and 5. All are inclined to the northeast. Shaft No. 2 is 1000 feet, with a winze to 1100 feet, Shaft No. 3 is 1400 feet and Shaft No. 5 is 400 feet deep on the incline. Shafts No. 3 and 5 are connected on the 400-foot level, and Shafts No. 2 and 3 via raises between the 1400-foot level of shaft No. 3 and the 1100-foot winze level of Shaft No. 2. On the 1400-foot level in the Shaft No. 3 area, a northeast-inclined winze extends to the 3400-foot level, the deepest portion of the mine. Copper and zinc mining done by the Penn Chemical Company in 1948-53 was in the Shafts No. 2 and 3 areas. The latest underground work done in 1955-57 by the Standard Mining Corporation, was on the 400-foot level in the area of Shaft No. 3.

There have been several mills and two smelters on the property at different times in the past. The last mill, which was used to produce zinc and copper-lead concentrates during the period of 1949-53, was erected by the Penn Chemical Company. It was equipped with a Pacific jaw crusher, vibrating screen, Symons cone crusher, Hardinge conical ball mill, Pan-American jig, Knudsen bowl, and two flotation circuits; a copper circuit containing a conditioner tank and five Denver sub-A cells which yielded a copper-lead-gold-silver concentrate, and a zinc circuit containing a conditioner tank and 12 Denver sub-A cells. Most of the equipment has been removed, and only some of the buildings, wooden headframes, and wooden precipitation tanks remain on the property.

Quail Hill (Eagle Copper and Silver) mine

Location: W½ and S½ sec. 3, T. 1 N., R. 11 E., M.D.M., 7 miles west of Copperopolis. Ownership: G. Ivan Smith, 4333 East Florence Avenue, Bell, California.

The Quail Hill mine is on ground patented in July 1879 as the Eagle Copper and Silver mine. It was the first mine located in the Foothill belt, and at different times has been worked for gold and copper.

A gold-bearing gossan was discovered by Hiram Hughes in 1860 on what is now the Quail Hill mine. The presence of copper was soon discovered, and in 1863, it was reported that 300 tons of ore averaging 25 percent copper had been shipped (Mining and Scientific Press, Aug. 17, 1863, p. 1). The mine lay idle from the latter part of 1863 through 1866. The following year, a stamp mill was erected on the property, and production of 2 or 3 tons of gold-quartz per day began. Material from a 10-foot shaft was reported to have yielded $100 per ton, and that from the surface $36 per ton in gold and $9 per ton in silver (Am. Jour. Mining, 1867, p. 308). The next recorded activity was in 1877, when the mine was worked for gold under the name "Eagle" mine. The Quail Hill mine has no known record of production from 1868 until 1917, when the Quail Hill Mining Company mined ore for 3 years from the 170-foot level and above. In 1920 the mine changed hands; except for a brief period of activity in 1938, it was then idle until 1942. Intermittent production in 1943-45 yielded more than 8000 tons of ore from which copper, lead, zinc, gold, and silver were recovered. The last operator was

G. Ivan Smith, owner of the mine. The Quail Hill mine has yielded a total of 12,687 tons of ore since 1917. Approximately 453 tons of copper, 1,032 tons of zinc, and 74 tons of lead were recovered from this material, along with 3,866 fine ounces of gold and 65,466 fine ounces of silver (Heyl, 1948, p. 114).

The top of the largest ore shoot was 100 feet from the surface. Its average dip was 50° E. and it pitched 68° SE., pinching out at a depth of 240 feet. Smelter returns on ore mined from this body during World War I showed an average of 5.58 percent copper, 15.60 percent zinc, 0.40 ounces gold, 6.51 ounces silver, and a range of 0.5 to 1.8 percent lead (Heyl, 1948, p. 117). This ore body, and other smaller ones in the mine, appear to have been localized by pre-ore faults, irregularities in the adjacent west-trending felsite-greenschist contact, and possibly by kaolinized dikes.

Mineralization at Quail Hill consists chiefly of lenticular ore shoots that have replaced intrusive felsite in shear zones adjacent to its contact with greenschist. Pyrite, kaolin, sericite, magnetite, and silica are products of wall-rock alteration. The pyrite, much of which is auriferous, is widespread, and increases in abundance as the ore bodies are approached. Sericite is less important, but is prominent in strongly pyritized rock. Finely disseminated magnetite is restricted to bedded tuff in the hanging wall. Widespread kaolinization has affected the felsite and, to a lesser extent, the hanging-wall tuff. Silicification is limited to local areas in the felsite. The Quail Hill ore is a complex replacement type consisting of sphalerite, chalcopyrite, pyrite, small amounts of galena, and some gold and silver. Barite is the chief gangue mineral, but quartz, calcite, and a powdery chlorite also are present.

The principal workings consist of a two-compartment, 280-foot vertical shaft, with levels at 70, 170, 205, and 270 feet, and sublevels at 190 and 296 feet. These drifts are principally north and west of the main shaft, and range in length from 50 to 350 feet. Two glory holes to the northwest are connected with a northwest-extending adit, the portal of which is just north of the shaft collar. The shaft and the adit are open. The ore was treated in a mill, which has been removed. The wood headframe and several buildings remain on the property.

Star and Excelsior mine

Location: SW¼ sec. 24, and NW¼ sec. 25, T. 1 N., R. 11 E., 2 miles southeast of Telegraph City and 1 mile due south of the Napoleon mine. Ownership: H. L. Donner, Milton, California.

This copper mine was first worked during the 1860s, as were other mines in the area. It was active in 1914 (Tucker, 1916, p. 62) and again in the late 1920s (Heyl, 1948, p. 125). For the past few years the owner has been intermittently recovering cement copper from the mine waters.

The deposit consists of a zone of pyritization, kaolinization, and silicification containing various amounts of chalcopyrite, sphalerite, and secondary copper minerals; it is capped by gossan. The zone ranges from a few to as much as 50 feet in thickness and is at least 350 feet long. It has a north to N. 30° W. strike and dips 75° E. Another smaller zone is 200 feet to the east. Country rock is greenstone of the Amador (?) group and intrusive quartz and feldspar porphyry.

The mine is developed by an old caved 100-foot shaft and a newer shallower open shaft, two open west-extending crosscut adits to the south (including one 180 feet in length), and open cuts. Mine water from the lower adit is sent through a string of small wooden tanks containing scrap iron, where cement copper is recovered.

Gold

Gold is the best-known mineral commodity of Calaveras County and was the chief attraction to the early-day settlers in the area. Since 1880, the value of the recorded gold output of the county has amounted to $78,031,158. However, the value of the total gold output of the county is much greater because of the vast yield from the rich surface placers mined during the gold rush, for which production records are not available. Since World War II, gold production in Calaveras County has followed a diminishing trend. In 1955, the latest year for which detailed figures are available, gold output was 399 fine ounces valued at $13,965.

Lode Gold

Lode gold mines are grouped in three areas—the Mother Lode, East Gold Belt, and West Gold Belt. Although this grouping is convenient for the sake of discussion, each area has certain distinctive characteristics.

The Mother Lode belt traverses western Calaveras County in a northwesterly direction. It is a system or zone of mesothermal gold-quartz veins and bodies of mineralized country rock adjacent to the veins. The system ranges from a few hundred feet to about 2 miles in width and contains numerous discontinuous or linked veins which may be parallel, convergent at small angles, or en echelon. Few individual veins can be traced for more than a few thousand feet. They have been formed within a zone of reverse faulting, and repeated movements along the fault fissures have facilitated the passage of ascending mineral-bearing solutions. The veins strike in a northwesterly direction and dip steeply to the northeast. Individual quartz veins and bodies of mineralized country rock range from less than a foot to scores of feet in thickness. The veins may pinch and swell abruptly, and the ends may fray out into stringers or veinlets. Stringer zones are commonly found in both adjacent footwall and hanging walls.

Vein matter consists of milk-white quartz with various amounts of gold and pyrite and small amounts of other sulfides, which include arsenopyrite, chalcopyrite, galena, sphalerite, and tetrahedrite. Gold is in small grains and masses in the native state or intergrown with sulfides, chiefly pyrite. Although galena is sparingly distributed in Mother Lode gold ores, it is generally regarded with high favor, as its presence indicates increased gold content (Knopf, 1929, p. 37). Tellurides, of which petzite

is the most common, have been found at Carson Hill. Besides quartz, other gangue minerals present in various amounts are ankerite, calcite, chlorite, limonite, mariposite, sericite, talc, and sheared fragments of wall rock.

Mother Lode gold ores are low to moderate grade (one-third of an ounce of gold or less per ton), but the ore bodies or shoots are large. The ore shoots are generally short, 200 to 300 feet being the average stope length. However, they persist at depth, some having been mined to depths of several thousand feet. In some shoots the gold is distributed uniformly across the width of the vein, but in many cases the paying ore is either near the hanging wall or footwall and occasionally in the center of the vein. Ore shoots commonly are where there are bulges in the vein, shear zones, or abrupt changes in strike or dip, or are near vein intersections. Although ribbon quartz has been regarded as a favorable indicator of ore, many veins are ribboned and contain no gold.

Bodies of mineralized country rock have been classified into two types—hydrothermally altered masses of augitic greenstone, which commonly is referred to as "gray ore", and masses of hydrothermally altered amphibolite and chlorite schist. Gray ore has not been economically important on the Mother Lode belt in Calaveras County, but large masses of mineralized schist have been mined at Carson Hill and to a lesser degree at Angels Camp and to the north. Mineralized schists consist predominantly of ankerite with pyrite, sericite, chlorite, quartz, and albite. Mineralized schist ore bodies were generally of low grade (a ninth to a tenth of an ounce of gold per ton); but one notable exception was the famous hanging-wall ore body at the Melones mine, which averaged more than half an ounce, and in some portions contained as much as 2½ ounces, of gold per ton.

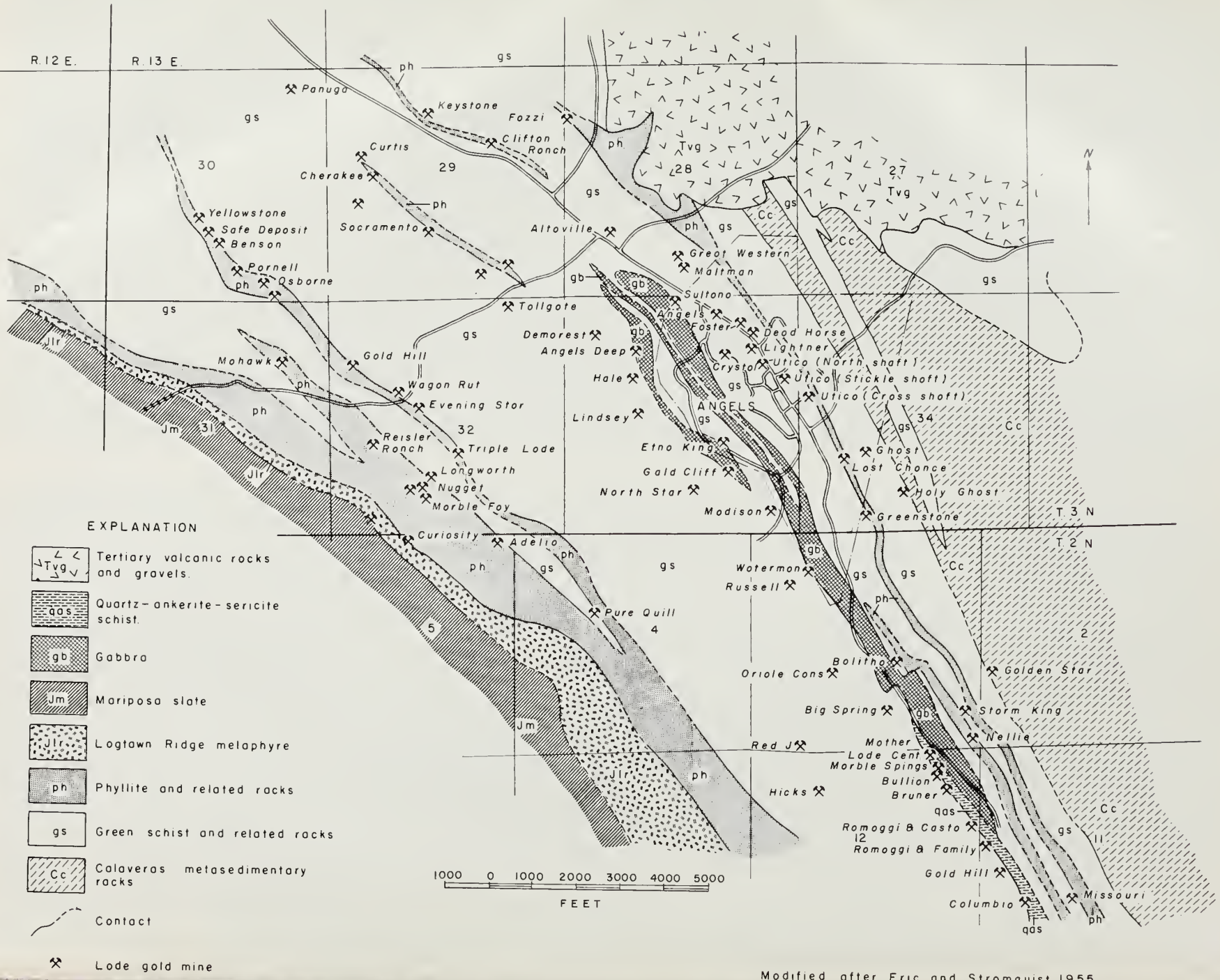
In the north portion of the Mother Lode belt in Calaveras County, the veins are in black Mariposa slate, which is part of the same slate belt that contains the highly productive mines in the Jackson-Sutter Creek area of Amador County. There is in this belt an apparent split or west branch which extends south to the old mining town of Paloma and which contains the previously highly productive Gwin mine. The main Mother Lode system extends southeast to San Andreas. West and northwest of San Andreas, a large serpentine body lies just to the east of the mines. From San Andreas southeast to the area between San Domingo Creek and Bruner Hill some 2 miles northwest of Altaville, the belt is in amphibolite and chlorite schist; phyllites lie immediately to the east. The Mariposa slate beds lie to the west.

In the Altaville-Angels Camp district, the geology is extremely complex (see fig. 2). The Mother Lode widens to a maximum of about 2 miles, and there are several major veins systems containing a number of important mines. One extending along the west side of the area contains the Benson, Gold Hill, Osborne, Wagon Rut, and Triple Lode mines; one just west of Angels Camp contains the Angels Deep, Lindsey, Gold Cliff, and Madison mines; another extending through the central portion of the town contains the Altaville, Sultana, Lightner, Utica, and Stickles mine; and one on the east is known as the Dead Horse Lead. The predominant country rock in the area is amphibolite-chlorite schist. To the west are a thin belt of fine-grained metasediments and metavolcanics assigned to the Amador group and a mile-wide belt of metasediments assigned to the Mariposa formation by Eric and Stromquist (Eric, Stromquist, and Swinney, 1954, plate I), but classified as being part of the Calaveras group by Ransome (Ransome, 1900, economic geology sheet no. 1, section 2). To the east are metasediments of the Calaveras group. A sketch map of the vein systems in this area appears in the Tenth Report of the State Mineralogist (Fairbanks, 1890, p. 61). South of Angels Camp the Mother Lode belt narrows to less than a mile and continues southeast through the Carson Hill area. Here the geology also is complex (see fig. 5, and *Carson Hill mines* under Lode Gold). Essentially the rocks consist of large bodies of auriferous schist and ankerite-mariposite rock adjacent to massive and commonly barren quartz veins.

Lode mines east of the Mother Lode are commonly referred to as the East Gold Belt. Although there are no extensive and closely associated vein systems such as those on the Mother Lode, the gold-bearing veins in this area do have certain distinct features. East Belt veins are narrower and the ore bodies smaller than those of the Mother Lode, but often they are rich. Many of the veins have north or northwest strikes, but others are oriented in a northeasterly and some in an almost due easterly direction. Most have steep dips. The number of individual mines is extremely large (see figs. 3 and 4).

Vein filling consists of white to grayish or grayish-black smoky quartz; the presence of smoky quartz is a characteristic feature of some East Belt gold mines. Also, some of the vein quartz in the Murphys area is light rose in color. The ore contains native gold and abundant sulfides, chiefly galena, pyrite, and chalcopyrite. Galena is nearly always present in East Belt ores. The ore commonly averages two-thirds of an ounce to an ounce of gold per ton, and considerable quantities of high-grade ore have been mined from small but rich pockets. The ore shoots are rarely more than a few hundred feet in stope length, and most are considerably less. The ore shoots commonly pitch or rake at relatively small angles. As in the Mother Lode, abrupt changes in strike and dip and vein intersections are favorable locations for ore bodies. Those portions of the veins that have been sheared and fractured also are more favorable for the formation of paying ore than the massive portions of the vein.

In the north portion of the East Belt in the West Point-Glencoe-Railroad Flat districts, the deposits are associated with a west-trending elongate granodiorite body, that is intrusive into metasedimentary rocks of the Calaveras formation. The veins are either in the granodiorite or surrounding metamorphic rocks which consist chiefly of mica or quartz-mica schist with smaller amounts of slate, graphitic schist, and metachert. Numerous dikes of fine- to medium-grained diorite and quartz diorite intrude the country rock.



Modified after Eric and Stromquist, 1955.

Figure 2 (above). Map of the Angels Comp district showing geology and lode mines.

Name of mine	Location			Name of mine	Location			Name of mine	Location		
	Sec.	T (N)	R (E)		Sec.	T (N)	R (E)		Sec.	T (N)	R (E)
Adelia	5	2	13	Gold Cliff	33	3	13	North Star	33	3	13
Altaville	28	3	13	Golden Star	2	2	13	Nugget	32	3	13
Angels	33	3	13	Gold Hill	32	3	13	Oriole Cons	3	2	13
Angels Deep	33	3	13	Gold Hill	11	2	13	Osborne	30	3	13
Benson	30	3	13	Great Western	28	3	13	Panuga	30	3	13
Big Spring	3	2	13	Greenstone	34	3	13	Parnell	30	3	13
Bolitha	3	2	13	Hale	33	3	13	Pure Quill	4	2	13
Bruner	10	2	13	Hicks	10	2	13	Red J	3	2	13
Bullion	10	2	13	Holy Ghost	34	3	13	Reisler Ranch	32	3	13
Cherokee	29	3	13	Keystone	29	3	13	Romaggi & Costa	10	2	13
Clifton Ranch	29	3	13	Last Chance	34	3	13	Romaggi Family	11	2	13
Columbia	11	2	13	Lightner	33	3	13	Russell	3	2	13
Crystal	33	3	13	Lindsey	33	3	13	Sacramento	29	3	13
Curiosity	5	2	13	Longworth	32	3	13	Safe Deposit	30	3	13
Curtis	29	3	13	Madison	33	3	13	Storm King	3	2	13
Dead Horse	33	3	13	Maltman	28	3	13	Sultana	33	3	13
Demarest	33	3	13	Marble Fay	32	3	13	Tollgate	32	3	13
Etna King	33	3	13	Marble Springs	10	2	13	Triple Lode	32	3	13
Evening Star	32	3	13	Missouri	11	2	13	Utica	33, 34	3	13
Fazzi	28, 29	3	13	Mohawk	31	3	13	Wagon Rut	32	3	13
Foster	33	3	13	Mother Lode Central	10	2	13	Waterman	3	2	13
Ghost	34	3	13	Nellie	3	2	13	Yellowstone	30	3	13

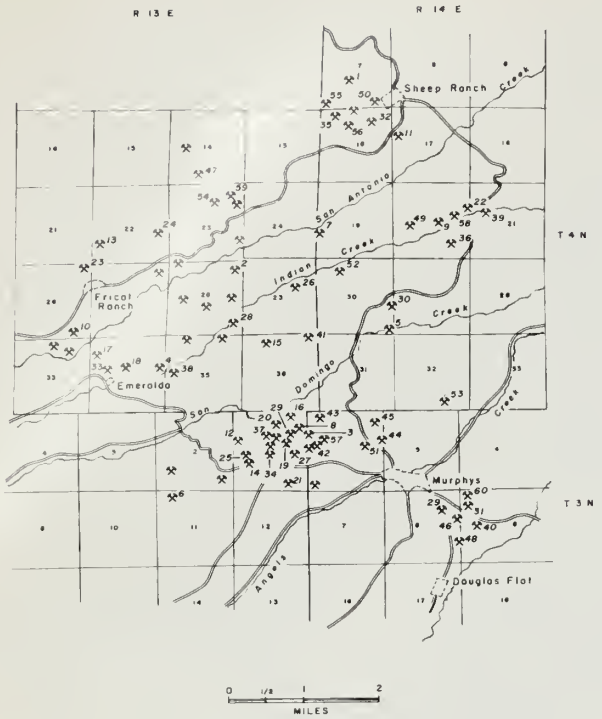


Figure 3. Sketch map af the Murphys, Esmeralda, Washingtan, and Sheep Ranch districts, shawing lode gald mines.

Name of mine	Location		
	Sec.	T (N)	R (E)
1 Admiral Dewey	7	4	14
2 Alameda	26	4	13
3 Beatrice	1	3	13
4 Bence	34	4	13
5 Big Horn	30	4	14
6 Bonanza Pocket	11	3	13
7 Bon Ton	24	4	13
8 Buckhorn	1	3	13
9 Caruther	20	4	14
10 Chaparral and Blue Ribbon	28	4	13
11 Chavenne	17	4	14
12 Christmas	1	3	13
13 Cow Bell	22	4	13
14 Crown Point	1	3	13
15 Dora Cons.	36	4	13
16 Dragone	1	3	13
17 Economic	33	4	13
18 Esmeralda	34	4	13
19 Eureka	1	3	13
20 Fair Play	1	3	13
21 Falcon	1	3	13
22 Fenian	20, 21	4	14
23 Fricot Cons.	28	4	13
24 Friendship	22	4	13
25 Garfield	1	3	13
26 Golden Reef	25	4	13
27 Great Divide	1	3	13
28 Gumboot	26	4	13
29 Hidden Treasure	1	3	13
30 Hill Top	29	4	14
31 Hub	9	4	14
32 Hurricane	18	4	14
33 K. and J.	34	4	13
34 Last Chance	1	3	13
35 Lost Boy	18	4	14
36 Lost Log	20	3	14
37 Manhatten	1	3	13
38 Maria	35	4	13
39 Mar John	21	4	13
40 Matteson	9	3	14
41 Max Gross	36	4	13
42 Mayflower	6	3	14
43 Miralda	6	3	14
44 Oro y Plata	6	3	14
45 Pay Rock	6	3	14
46 Piety Hill	8	3	14
47 Pilot	14	4	13
48 Poverty Hill	9	3	14
49 Right Bower	20	4	14
50 Sheep Ranch	7	4	14
51 Silver Star	6	4	14
52 Sonoma	30	4	14
53 Tanner	32	4	14
54 Thomas	23	4	13
55 Tom Smith	7	4	14
56 Toon	18	4	14
57 Total Wreck	6	3	14
58 Washington	20	4	14
59 Wheelock	23	4	13
60 White Pine	9	3	14
61 Greek	14	4	13
62 Dalmatia	26	4	13
63 New Ford	26, 35	4	13
64 Brazza	34	4	13
65 Bonehord	33	4	13
66 Lodi	18	4	14
67 Basco	33	4	13

To the south in the Sheep Ranch district, the veins trend in a northwesterly direction, dip to the northeast and are located near a gabbro body that has intruded quartz-mica schist and slate. Many of the veins in this area contain smoky quartz. The Sheep Ranch mine was the most productive of all the East Belt mines. In the Murphys-Esmeralda and Collierville districts, many of the veins trend in a westerly direction and dip to the north. The country rock here is quartz-mica schist and graphitic slate. Large bodies of limestone lie just to the east and south of the mineralized area.

The West Belt generally refers to all lode gold deposits west of the Mother Lode vein system. Since the gold mineralization is sporadic, mine development and production have not been extensive or sustained. The gold-bearing quartz veins generally strike northwestward and dip moderately to the northeast. Country rock is Mariposa slate, greenstone of the Logtown Ridge formation, and serpentine. Gold has been recovered also from foothill copper-zinc ores.

Hodson, 3 miles northwest of Copperopolis, has been an important gold-producing district in the West Belt. There the veins range from 2 to 20 feet in thickness. The ore generally contains less than a third of an ounce of gold per ton, but the ore bodies are extensive. Adjacent to some of the Hodson veins are stockworks of auriferous greenstone similar to the gray ore of the Mother Lode, notably at the Royal and Mountain King mines. The gray ore consists of pyrite-ankerite-sericite rock that has resulted from the hydrothermal alteration of metavolcanic rocks of the Logtown Ridge formation.

Lode mining began in Calaveras County early during the gold rush—probably at Carson Hill in 1850 when rich veins were being mined at shallow depths in the Morgan mine. Soon thereafter rich surface ores were being mined throughout the Mother Lode and in various areas in both the East and West Gold Belts. Noted mines such as the Angels, Gold Cliff, Gwin, Lightner, Osborne, Wolverine, and Woodhouse mines were discovered in the early 1850s. However, the rich surface ores were soon exhausted, and quartz mining underwent many difficulties for at least 15 years following the early discoveries. These difficulties were due chiefly to the hand-drilling methods and black powder in use at the time, which made underground development work slow and costly, and to crude milling methods. Although stamp mills were active during the 1850s, many were unsuccessful. Dynamite and the first air drills were introduced in California in the late 1860s, but widespread use of air drills for stoping ore did not come for some years.

Lowering the costs of underground work necessitated an increase in milling capacities. Stamp mills were increased in weight, and feeders and rock breakers were introduced. New concentrating devices were introduced also. Sluices, which were first used to concentrate sulfides, were replaced by buddles and then by vanners. The latter equipment came into general use during the 1880s. The chlorination process was brought to California from Europe, and until replaced by cyanidation in the 1890s, was used at many mills to recover gold from the concentrates. As mining and milling progressed, the demand for power increased. Steam engines using wood for fuel were the principal sources of power at first. The development of extensive ditch systems led to the use of water under high pressure for mining and milling. As late as 1915, the 100-stamp mill at the Melones mine was operated by water power. However, electric power was in general use by that time.

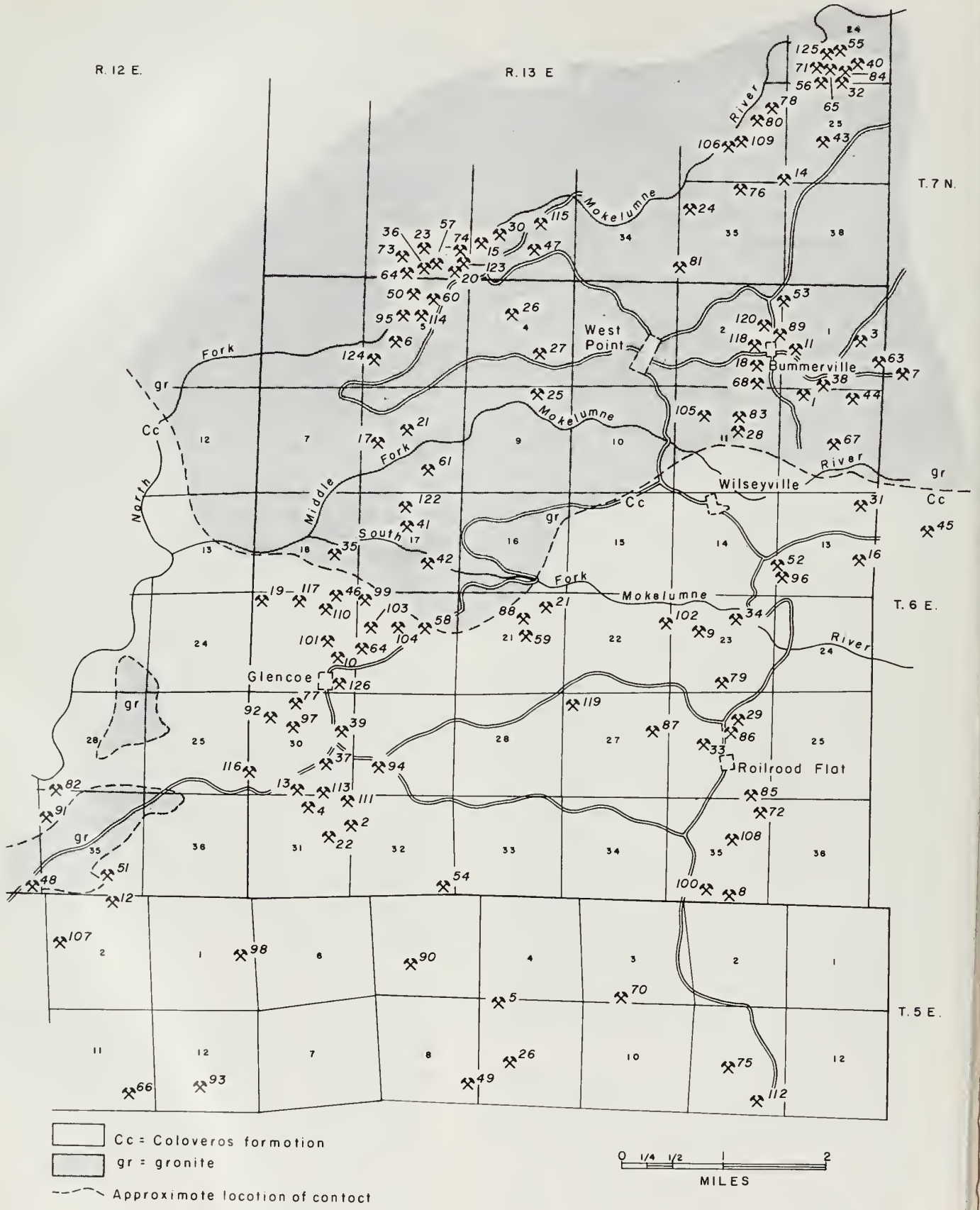
Probably the most productive period of lode mining in Calaveras County was from around 1893 to about 1918. During these years, many of the important lode mines were operated on a major scale and several thousand men were employed. The payroll at the Utica mine alone carried as many as 500 names at one time. Large mills were erected, the Royal mine was equipped with a 120-stamp mill, and mills at the Gwin and Melones mines were rated at 100 stamps each. However, mining costs continued to increase and the consequent gradual decrease in lode mining was accelerated by World War I. The Gwin mine was shut down in 1908, the Utica and Lightner mines in 1915, the Angels in 1918, and the Gold Cliff in 1920. Activities at Carson Hill continued until 1926, but the output was largely from the newly discovered hanging-wall ore body. Many of the smaller but active lode mines in the West Point-Railroad Flat-Murphys areas were shut down also.

During the depression years of the 1930s, low mining costs coupled with a rise in the price of gold caused a revival of lode gold mining. During these years the increasing use of flotation, the perfection of the cyanidation process, the use of filters, and the introduction of multiple-stage crushing and grinding also made it possible to mill gold-bearing sulfide ores much more cheaply. Numerous stamp mills were still in use, but they were either completely replaced or supplemented by the introduction of heavy-duty ball mills and classifiers. The Carson Hill and Sheep Ranch mines were reopened and worked on a major scale. Numerous medium-sized lode gold operations such as those at the Easyz Bird, Kate Hageman, Lockwood, Mar John, Mother Lode Central, and Oro y Plata mines were active also. Lode gold mining ceased during World War II. Since then there has been only a limited amount of activity, chiefly in the West Point district.

Alto mine

Location: In Rancho Del Rio in Scorpion Gulch, 6 miles south-southeast of Copperopolis. Erroneously shown in Stanislaus County on page 629 of the Fourteenth Report of the State Mineralogist (F. L. Lowell, 1916). Ownership: Gaylord Estate, c/o George S. Gaylord, 475 Huntington Drive, San Marino, California.

The Alto gold mine was originally discovered in 1886 by George W. Blazer, the father of Tom Blazer of Roseville, who worked at the mine during most of its period of activity. The mine was operated on a limited scale until 1896 when the Utica Mining Company gained control of the property. This concern developed the


R. 12 E.
R. 13 E
T. 7 N.
T. 6 E.
T. 5 E.
Mokelumne River
North Fork
Middle Fork
South Fork
West Point
Bummerville
Wilseyville
Glencoe
Railroad Flat
gr
Cc
Cc = Coloveros formotion
gr = gronite
Approximote locotion of contoct
0 1/4 1/2 1 2
MILES

Name of mine	Location			Name of mine	Location		
	Sec.	T (N)	R (E)		Sec.	T (N)	R (E)
1 Alaska	12	6	13	64 Lone Star	32	7	13
2 Alexander	31, 32	6	13	65 Lost Mexican	24	7	13
3 Alliance	1	6	13	66 Lucky	11	5	12
4 Alpha	31	6	13	67 Marquis	12	6	13
5 American Eagle	9	5	13	68 Matrimony	2	6	13
6 Auction	5	6	13	69 Mexican	20	6	13
7 Austrian	6	6	14	70 Michel	10	5	13
8 A.V.G.	35	6	13	71 Minnesota	24	7	13
9 Bald Eagle	23	6	13	72 Mohawk	35	6	13
10 Banner	19	6	13	73 Mohican	32	7	13
11 Bartola	1	6	13	74 Monmouth	32	7	13
12 Beggar	2	5	12	75 Morning Star	11	5	13
13 Bendigo	30	6	13	76 North Star	35	7	13
14 Billy Williams	26	7	13	77 Nucleus	30	6	13
15 Black Oak	33	7	13	78 Oakum	26	7	13
16 Black Oak and Glory Forth	13	6	13	79 Old Dan Reynolds	23	6	13
17 Blackstone	8	6	13	80 Old Gray	26	7	13
18 Blazing Star	2	6	13	81 Old Henry	34, 35	7	13
19 Blue Jay	19	6	13	82 Ophir Cons.	35	6	12
20 Boulder	32	7	13	83 Oriental	11	6	13
21 Buena Vista	8	6	13	84 Owl	24	7	13
22 Bull Dog	31	6	13	85 Pay Day	26	6	13
23 Calaveras Columbus	32	7	13	86 Petticoat	26	6	13
24 Calendar	35	7	13	87 Poe	27	6	13
25 Carlton	9	6	13	88 Poor Man	21	6	13
26 Centennial	4	6	13	89 Pride of Bummerville	2	6	13
27 Champion	4	6	13	90 Prussian Hill	5	5	13
28 Chino	11	6	13	91 Quartz Glen	35	6	12
29 Clary	26	6	13	92 Ridge View	30	6	13
30 Continental	33	7	13	93 Rindge No. 1	12	5	12
31 Corn Meal	13	6	13	94 Rindge No. 3	29	6	13
32 Cross	24, 25	7	13	95 Riverside	5	6	13
33 Dan Reynolds	26	6	13	96 Rough and Ready	13	6	13
34 Eberhardt	23	6	13	97 Ruth Belle	30	6	13
35 Etna	18	6	13	98 Salvador	6	5	13
36 Ever Ready	32	7	13	99 San Bruno	20	6	13
37 Fidelity	30	6	13	100 Sanderson	35	6	13
38 Fredda	1, 12	6	13	101 San Pedro	19	6	13
39 Garibaldi	30	6	13	102 Senica	22, 23	6	13
40 General Arthur	24	7	13	103 Sierra King	20	6	13
41 Gilded Age	17	6	13	104 Sierra Queen	20	6	13
42 Glencoe	17	6	13	105 Soap Root	11	6	13
43 Gold Bug	25	7	13	106 Soren	26	7	13
44 Golden Rule	12	6	13	107 Sparrow Hawk	2	5	12
45 Gold Star	18	6	14	108 Stand By	35	6	13
46 Good Hope	19	6	13	109 Star of the West	26	7	13
47 Granite	33	7	13	110 Stoetzer	19	6	13
48 Hawkins	34	6	12	111 Stonewall Jackson	31, 32	6	13
49 Hazel Dell	8	5	13	112 Summit	11	5	13
50 Humming Bird	5	6	13	113 Summit	30, 31	6	13
51 Ilex	35	6	12	114 Swallow	5	6	13
52 Jasper	13	6	13	115 Sweepstakes	33	7	13
53 John Henry	2	6	13	116 Tangier	30	6	13
54 Kaiser Wilhelm	32	6	13	117 Valentine	19	6	13
55 Keltz	24	7	13	118 Water Lily	2	6	13
56 Last Chance	25	7	13	119 Wet Gulch	27	6	13
57 Last Chance	32	7	13	120 Wide West	2	6	13
58 La Verne	20	6	13	121 Wolverine	21	6	13
59 Lawson	21	6	13	122 Woodhouse	17	6	13
60 Linnet	5	6	13	123 Yanix	32	7	13
61 Littlefield	8	6	13	124 Yellow Aster	5	6	13
62 Little Giant	9	5	13	125 Victory	24	7	13
63 Lockwood	1	6	13	126 Spring Day	19	6	13

Figure 4 (opposite). Sketch map of the West Point-Railroad Flat-Glencoe district, showing lode gold mines.

mine on a major scale and erected a 10-stamp mill. In 1902, the firm of Wright and Lane of Knight's Ferry came into control. The mill was increased to 40 stamps, and much of the output during the following years was by glory-hole mining. In one year it was reported to have yielded 75,000 tons of ore (Mining and Scientific Press, 7/7/06, p. 24). The mine was shut down in 1907, and the mill was destroyed by fire soon afterward. Minor work was done later on, and in 1910 the California Calaveras Mining Company was reported to have recovered some gold at the property (U. S. Bureau of Mines records). The mine has been idle since, and for some years it was in litigation (Lowell, 1916, p. 629). The value of the total production is estimated to be about 1 million dollars worth of gold at the old price (Tom Blazer, personal communication, 1959).

There are two principal veins on the property, which in the vicinity of the principal workings are several hundred feet apart. They converge to the north. The west vein, which was the most extensively worked, consists of an extensive dike-like body of mineralized greenstone. The greenstone is massive, fine grained, dark in color, and impregnated with disseminated fine-grained pyrite. The ore body is 50 to 75 feet thick and has been mined for a distance of at least 600 feet along the strike. It strikes N. 50° W. and dips steeply to the northeast or is vertical. The ore contains a large number of thin parallel quartz stringers and veinlets that are somewhat folded and faulted. However, the total amount of quartz present is small. Comb structures are common in some of the veinlets. Country rock is grayish-black Mariposa slate which strikes N. 45° W. to N. 75° W. and dips steeply to the northeast. Portions of the area are overlain by Tertiary channel gravels and Table Mountain latite; part of Table Mountain is just to the west. The portal of an old bedrock west-trending adit is just north of the property. The east vein is not exposed.

During the period of glory-hole mining, which was from about 1902 to 1907, both vein material and wall rock were reported to have been milled, and the mill heads had an average value of about $1.20 per ton (Tom Blazer, personal communication, 1959). However, ore from the quartz veins contained up to $10 per ton. The gold was both in the free state and in pyrite; the sulfide concentrates usually averaged $35 to $40 per ton in value. Some high-grade ore was encountered.

A main glory hole on the west vein is about 500 feet long, 250 feet wide, and as much as 100 feet in depth. Four hundred feet east of the glory hole is a 450-foot vertical shaft on the east vein with levels at 100, 200, 300, and 400 feet and a small glory hole approximately 500 feet to the southeast. A crosscut on the 100-foot level extends west to the main glory hole, and a drift on this level extends southeast to the small glory hole. The most productive portion of the east vein was on the 300-foot level where considerable stoping was done. From the shaft on this level, drifts extend 400 feet to the northwest and 400 feet to the southeast. The shaft is open and the underground workings are partially accessible. The dumps, which consist predominantly of slate, are extensive. The 40-stamp mill was equipped with Frue vanners. All equipment has been removed from the property.

Angels (Big, Southwell) mine

Location: NW¼ sec. 33, T. 3 N., R. 13 E., M.D.M., in Angels Camp on the west side of State Highway 49 between the Sultana and Lightner mines. Ownership: Utica Mines, Inc., 220 Montgomery Street, San Francisco, California.

The Angels gold mine, which also has been known as the Big mine and the Southwell mine, is a consolidation of the Angels, Billings, Crystal, Doc Hill or Doctor Hill, Minnie Hennesay, McCormick, Oneida, Potter, and Valentine Jr. claims. The Angels claim was originally worked in the late 1850s (Logan, 1935, p. 127) and in 1872 was developed by a 600-foot shaft and equipped with a 30-stamp mill (Mining and Scientific Press, 2/24/72, p. 196). The Doctor Hill claim had yielded $250,000 by 1867 (Logan, 1935, p. 127). In 1882 the Potter claim was being worked through a 100-foot shaft (Mining and Scientific Press, 2/11/82, p. 92). In 1886, the claims were consolidated by the Angels Quartz Mining Company and worked as a unit almost continuously until March 1918. A $100,000 pocket was reported to have been discovered on the Crystal claim in 1910 (Mining and Scientific Press, 4/9/10, p. 537). The total output of the property is unknown, but published figures show its value exceeds $3,250,000.

A number of quartz veins are on the property, but the bulk of the production was from two known as the Mother Lode and the East vein (Logan, 1935, p. 127). Some output was made from a rich narrow vein lying to the east of the main vein and from a vein to the west on the Crystal claim. All of the veins strike northwestward and dip steeply to the northeast. Country rock in the general area of the mine is green schist; gabbro lies to the west (Eric and Stromquist, 1955, plate I). The productive veins in the main ore zone had an average thickness of 20 feet; the footwall was diorite, the hanging wall a heavy talcose slate (Tucker, 1916, p. 69). Stope lengths ranged from 100 to 200 feet. The value of ore mined during the last years of operation ranged from $2 to $10 per ton and the concentrates ranged from $38 to $70 per ton in gold at the old price of $20 per ounce.

The principal working entry was the 850-foot Angels shaft. From the 850-foot level a winze was sunk to the 1050-foot level, and an 800-foot crosscut was driven east. The 600-foot Crystal shaft is located to the southwest. During the last operations, ore was mined on the 200-, 400-, and 500-foot levels. The mill, which treated about 200 tons of ore per day, was equipped with 40 stamps and 16 Frue vanners.

Angels Deep mine

Location: Sec. 33, T. 3 N., R. 13 E., M.D.M., ¼ mile west of Angels Camp. Ownership: Utica Mines, Inc., et al., 220 Montgomery Street, San Francisco, California.

This Mother Lode gold mine consists of the Hale, Johnson, Martinusen, Pat, Pioneer, and Smyth claims.

All were worked at shallow depths during the early days of the gold rush. In 1888, the Smyth claim was operated by the Suffolk Gold Quartz Company, and the ore was treated in a five-stamp mill (Irelan, 1888, p. 126). Ore from the Hale claim was treated also in this mill (Brown, 1890, p. 148). The property was active in 1896 when it was known as the Brown, Smyth and Ryland Consolidated (Crawford, 1896, p. 99). The Pioneer claim also was active about this time and was worked through a 187-foot shaft.

After an idleness of about 20 years the claims were consolidated by the Angels Camp Deep Mining Company in 1920 (Logan, 1921, p. 420). The Pioneer shaft was extended to a depth of 500 feet and a 20-stamp mill erected. However, little production was made and the mill was sold in 1929 (Logan and Franke, 1936, p. 240). In 1933, the mine was dewatered and rehabilitated by Earl Hyde of Altaville. It was operated until about 1936 but has been idle since.

A series of northwest-striking and northeast-dipping quartz veins and mineralized schist containing free gold and sulfides, including pyrite and arsenopyrite, constitute the ore body. Country rock consists of amphibolite and chlorite schist. Ore averaging $9 to $11 per ton in value was encountered during the 1930s (Logan and Franke, 1936, p. 240). The mine is developed by the 500-foot inclined Pioneer shaft with levels at 50, 135, and 423 feet, and the southern 140-foot vertical Smyth shaft with levels at 84 and 130 feet. Several thousand feet of drifts have been run. The last work done on the property was in the Smyth workings.

A. V. G. (Golden Sherer) mine

Location: SE¼ sec. 35, T. 6 N., R. 13 E., M.D.M., one mile southeast of Railroad Flat. Ownership: Mrs. Amelia Stotts, R.F.D. Box 35, Mokelumne Hill, California.

The A. V. G. gold mine was originally worked from 1934 to 1936 by the Golden Sherer Mining Corporation of Los Angeles (Amelia Stotts, personal communication, 1955). Some work was done on the property in 1939 and again in 1947 by C. L. Tibbals and Sons of Sacramento. In 1954, the mine was leased by J. R. Schofield of Far West Mining Enterprises, Inc., Mokelumne Hill, and in 1955 was sub-leased by Clemens Roark of Los Angeles. Some development work was done and a small amount of ore mined. It has been idle since. The total output of the mine is valued at approximately $12,000 (Amelia Stotts, personal communication, 1955).

Native gold, auriferous pyrite, and smaller amounts of galena and sphalerite are in a quartz vein that strikes in a northeasterly direction, dips moderately to the southeast, and ranges from 12 to 18 inches in thickness. Country rock is mica schist of the Calaveras group. Ore shipped to the Selby smelter in 1955 contained $13.50 to $16.50 per ton in gold. The mine is developed by a 200-foot inclined shaft with levels at 100 and 130 feet, and a 400-foot northeast-bearing drift adit. At the end of the adit short northwest and southeast crosscuts have been run. In 1947 a 40-foot inclined shaft was sunk from the top of the hill approximately 400 feet northeast of the main shaft (Donald Tibbals, personal communication, 1955).

Bence (Tellurium) mine

Location: E½ sec. 34, T. 4 N., R. 13 E., M.D.M., 1 mile east of Esmeralda School by Indian Creek. Ownership: Clarence Hengen et al., c/o Harry Hengen, San Andreas, California.

The Bence gold mine was originally worked in the 1860s (Mining and Scientific Press, 4/15/65, p. 227). It was probably worked during the 1870s and 1880s, but there is no record of these operations. In 1896, it was reported that the mine was being operated on a small scale (Crawford, 1896, p. 97). From 1925 to 1928 the property was operated by J. Hildreth of Los Angeles. The mine was intermittently active from 1932 to 1938; the operators were A. W. Paulson of San Francisco and J. E. King of Sonora. It has been idle since 1938. The value of the total output has been estimated to be several hundred thousand dollars.

This mine is on the east end of a major vein system which includes the Bonehard, K. and J., and Esmeralda gold mines (see Clark, 1954, plates 1 and 2). The vein ranges from 2 to 6 feet in thickness, strikes in a westerly direction and dips 60 to 75 degrees to the north. As in the case of the other mines in the district, the ore contained free gold and often abundant amounts of sulfides. Ore mined in the 1930s was reported to have contained $10 per ton in free gold (Logan and Franke, 1936, p. 242). Some tellurides were recovered during the early period of operation. Country rock is graphitic slate and quartz-mica schist; green schist lies just to the south.

The mine is developed by a 150-foot north crosscut adit to the vein, from which a 400-foot drift extends westward. Two shafts have been sunk to depths of 175 and 400 feet. The vein has been stoped to the surface adjacent to the shafts. The ore was treated in a five-stamp mill, only portions of which remain. The workings are open.

Benson mine

Location: S½ sec. 30, T. 3 N., R. 13 E., M.D.M., 1½ miles due west of Altaville and 1 mile north of State Highway 8 by dirt road. Ownership: M. B. and J. E. Oliver et al., 135 East Magnolia Street, Stockton, California.

This gold mine is on the west side of the Mother Lode belt between the Safe Deposit mine on the northwest and the Osborne mine on the southeast. It was probably worked during the early days of the gold rush as were the other mines in the vicinity, when rich surface ores were recovered in quantity. Under the direction of John C. Benson, the mine was operated from the latter 1890s until 1909 and was reported to have had a large output (Logan and Franke, 1936, p. 247). The ore was treated in a 10-stamp mill. In 1936, this and the adjoining Parnell mine were prospected by the Cal-Gold Mining Com-

pany. A 20-ton mill was erected, but very little ore was mined, and the mine has been idle since.

The vein strikes northwestward and dips to the northeast. The hanging wall is amphibolite schist and the footwall is slate and phyllite. The vein is developed by a 510-foot inclined shaft with levels at 100, 200, 300, and 500 feet. The shaft is open. Most of the drifting has been done on the 100- and 200-foot levels (Logan and Franke, 1936, p. 247). Other than an old double-drum steam hoist, there is no equipment on the property.

Big Spring mine

Location: SE¼ sec. 3, T. 2 N., R. 13 E., M.D.M., 1½ miles south of Angels Camp, just west of State Highway 49 by the junction with the road to the fairgrounds. Ownership: Anna L. Sloan et al., Vallecito, California.

The Big Spring gold mine propably was originally worked during the gold rush, when considerable amounts of rich surface ores were mined in the general area. Little is known of subsequent operations. In 1914 the mine was idle, but was reported to have been developed to a depth of 100 feet (Tucker, 1916, p. 70). C. E. Gruwell of Angels Camp reopened it in 1932 and operated it almost continuously until 1941. Except for the dump being occasionally used as a source of road fill, the mine has been idle since 1941.

There are two veins on the property—the Mother Lode vein, and some 80 feet to the west at the surface, the Back vein. Both veins strike northwestward and dip to the northeast. The Back vein has an average thickness of 5 feet. The ore contains free gold, pyrite, and considerable gouge. Ore mined in 1938 was reported to have averaged $10 per ton in value, but occasionally is was valued as high as $60 per ton (Julihn and Horton, 1938, p. 129). Country rock is amphibolite and chlorite schist. The mine is developed by a 230-foot inclined shaft sunk on the Back vein. The shaft is open, but no equipment remains on the property.

Blackstone mine

Location: W½ sec. 8, T. 6 N., R. 13 E., M.D.M., 3½ miles west of West Point on the north slope of the canyon of the Middle Fork of the Mokelumne River. Ownership: Blackstone Mines, Inc., 5208 Barrett Avenue, Richmond 9, California; Lawrence A. Sanchez, President, and Elliott Symms, Superintendent.

One of the richer gold mines in the West Point district, the Blackstone was originally worked many years ago. During the 1930s and again immediately following World War II, it was operated intermittently by Fred Sumner of West Point. The Sanchez Brothers of Richmond obtained the property in 1947, and it has been active almost continuously since. Blackstone Mines, Inc., was organized with Mr. L. A. Sanchez as president and is now the operating company. The value of the total output is approximately $200,000 (Blackstone Mines, Inc., personal communication, 1957). One of the most productive years was in 1948 when 5,421 tons of ore were mined and milled. (U. S. Bureau of Mines, Minerals Yearbook, 1948, p. 1438).

This property consists of nine claims and is located on the same vein system that includes the Yellow Aster mine to the north and the Woodhouse mine to the south. The main or Blackstone vein, which has had the greatest amount of development work and production, has a strike ranging from N to N. 20° W. and dips 40 to 50 degrees to the west. It ranges from 6 inches to 8 feet in thickness. The ore contains free gold, galena, varying amounts of pyrite and chalcopyrite, and small amounts of sphalerite. The gold is nearly always associated with galena. The ore commonly contains half an ounce to 1

Photo 12. Underground scene in lower adit level of the Blackstone gold mine, West Point district. The wall rock is granodiorite. *Photo by Mary Hill.*

ounce of gold per ton, but there are some high-grade pockets. The most productive portions of the vein have been in shear and fault zones. Several nearly west-striking faults bound the principal ore shoots. The wide massive portions of the vein are relatively barren.

In the past few years the output has been chiefly from a north-pitching ore shoot having a stope length of about 200 feet in the upper levels; it is encountered some 475 feet in from the portal of the Lower Level adit, the present main working entry. A small but rich ore body has been encountered also about 100 feet in from the portal. Country rock is granodiorite. Several west- or north-striking and vertical-dipping, fine-grained, basic to intermediate-composition dikes cut the vein and the country rock. At least six other parallel veins are found on the property, four to the east and two to the west of the Blackstone vein. However, only a small amount of development work has been done on these veins.

In addition to the Lower Level adit, which was slightly longer than 500 feet at the time of visit (October 1957), the mine is developed by three overlying north-bearing drift adits, approximately 100 feet apart, which range from 600 to 700 feet in length. Near the crest of the hill a shaft has been sunk 95 feet. From the bottom of the shaft a 160-foot north drift and a 140-foot south drift have been driven. By the river, some 200 feet below the present working level, a short drift adit was run. The adit levels are connected by raises.

At the 50-ton mill, which is just above the Lower Level portal, the ore is sent through a small jaw crusher, a ball mill, and a jig. The jig concentrates are fed to a Wilfley table, and table concentrates are amalgamated. The table middlings and tails are recirculated. The jig overflow is classified, the sands returning to the ball mill and the slimes being directed to a bank of four flotation cells. Flotation concentrates are sent to the Selby smelter. Four men work at the mine and mill.

Boston (Boston Consolidated, Esperanza) mine

Location: SW¼ sec. 5, T. 5 N., R. 13 E., M.D.M., on Indian Creek, 2 miles northeast of Mokelumne Hill. Ownership: Boston Mokelumne Mining Company, c/o Edward R. Solinsky, Hobart Building, San Francisco, California.

The Boston gold mine, which has also been known as the Boston Consolidated or Esperanza, was active during the 1870s. In 1880 a 20-stamp mill was erected on the property (Mining and Scientific Press, 4/3/80, p. 213), and in 1892 surface ore was being mined (Logan, 1925, p. 145). Underground mining was done on a major scale beginning in 1893, and by 1900 the shaft was 1000 feet deep (Storms, 1900, p. 123). The mill was increased also to 30 stamps and a chlorination works was erected. The mine was shut down soon after 1900, and the mill was destroyed by fire in 1912. Some work was done on the property from 1920 to 1925 by the Morning Star Mining Company.

In 1933 the mine was leased by the Lucky Tiger Combination Gold Mining Company of Kansas City. It was partially rehabilitated, and a mill was erected. After mining and milling ore that yielded approximately $150,000, this concern ceased operations in 1935. From 1937 to 1939 a small amount of work was done by several lessees, but only a small production was made (Edward Solinsky, personal communication, 1957). The value of the total output of the mine is unknown but has been estimated to be about $1,000,000 (D. C. Demarest, personal communication, 1957).

The vein, which is as much as 50 feet wide, strikes in a northerly direction and dips 30° to 40° to the east. The ore contains free gold with pyrite and galena. During the 1930s, the ore averaged $4 per ton in gold at the new price ($35 per ounce), but some high-grade pockets were encountered. Country rock is chloritic and talcose schist of the Calaveras formation. Development consists of a 1000-foot inclined shaft with levels at 50, 100, 200, 300, 500, 700, and 950 feet and a glory hole above the 50-foot level. Most of the ore mined in the later operations was between the 150-foot level and the surface (Logan and Franke, 1936, p. 245). The mill, which had a capacity of 100 tons per day, included a 6- by 8-foot ball mill, five flotation cells, dewatering cone, and filter.

Bruner (Bald Hill, Gold Reserve, St. Lawrence) mine

Location: NE¼ sec. 10, T. 2 N., R. 13 E., M.D.M., 1 mile southwest of Angels Camp and just west of State Highway 49. Ownership: R. A. Miller et al., 1265 26th Avenue, San Francisco, California.

This Mother Lode gold mine—the Bruner, which also has been known as the Bald Hill, Gold Reserve, and St. Lawrence—was worked prior to 1890 (Brown, 1890, p. 150). In 1895 the Gold Reserve Consolidated Mining Company purchased this mine and the nearby Romaggi and the Romaggi & Costa claims and did some exploration work (Crawford, 1896, p. 106). Soon afterward it was taken over by the St. Lawrence Gold Mining Company. In 1900, the property was developed by a 400-foot inclined shaft (Storms, 1900, p. 120). Some work was done in the mine in 1913-14 (Logan, 1935, p. 128), and it was prospected again from about 1938 to 1940.

The vein strikes northwestward, dips northeast, and consists of a mixture of quartz stringers and country rock impregnated with free gold, auriferous sulfides, and ankerite. Country rock is chloritic amphibolite schist. The mine is developed by a 400-foot inclined shaft with levels at 100 and 400 feet. The ore was treated in a 10-stamp mill, which since has been removed from the property.

Buckhorn Consolidated (Buckhorn, Miralda, Red Gold) mine

Location: NE¼ sec. 1, T. 3 N., R. 13 E., M.D.M., 2 miles northwest of Murphys. Ownership: Mario D. and Florabelle Ceresa, Murphys, California.

This property is a consolidation of several gold mines, of which the Miralda and the Buckhorn or Red Gold, a quarter of a mile to the west, were the most important. Little is known of the early history, but extensive dumps indicate that both the Buckhorn and the Miralda mines were extensively developed many years ago.

After an idleness of some years the Buckhorn mine was reopened in 1894 (Crawford, 1894, p. 90). At that time it was developed by a 275-foot crosscut adit. In 1905, this mine was reported to have been worked by the Yellow Boy Mining Company of Salt Lake City (Mining and Scientific Press, 8/26/05, p. 145). It was active again around 1914, and the ore was treated in a five-stamp mill (Tucker, 1916, p. 102). Although there is no record of any subsequent work, the property may have been prospected during the 1930s.

There are at least three parallel quartz veins on the property which strike westward, dip 60 to 80 degrees south and range from 1 to 3 feet in thickness. The quartz ranges from glossy white to light rose in color. Country rock is quartz-mica schist and graphitic slate. The Buckhorn mine was developed by a 300-foot vertical shaft (now caved) with levels at 100, 200, and 300 feet; and a crosscut adit. The Miralda mine was developed by vertical shaft (now open) that appears to be 300 feet deep also. No equipment remains on the property.

Butcher Shop mine

Location: W½ sec. 29, T. 2 N., R. 12 E., M.D.M., in the Hodson area 3 miles northwest of Copperopolis. Ownership: Joseph Palter, Farmington, California.

The Butcher Shop gold mine was opened in 1947 by the owner and Frank Tower of Farmington and operated continuously until 1950. The production for this period was valued at approximately $80,000 (Joseph Palter, personal communication, 1955). The mine has been idle since 1950.

Native gold and pyrite are in a northwest-striking and northeast-dipping quartz vein. The hanging wall is serpentine with associated mariposite, and the footwall is Mariposa slate. The mine is developed by a 30-foot vertical shaft. From the bottom of the shaft a 26-foot crosscut extends northeast to the vein where drifts extend 75 feet to the southeast and 60 feet to the northwest. The ore was treated at the Royal mill.

Carson Creek (Jones, San Justo) mine

Location: Sec. 23, T. 2 N., R. 13 E., M.D.M., on the west side of Carson Creek, 1¼ miles due west of Melones. Ownership: M. H. Manuel, Murphys, California.

This gold mine is on the extreme west side of the Mother Lode gold belt. It was discovered about 1862 by Doctor Jones who sank a 100-foot shaft and erected a 10-stamp mill (Mining and Scientific Press, 7/8/82, p. 20). The mine was active again during the 1880s, when ore containing appreciable amounts of silver was reported to have been mined. From 1892 to about 1904, a considerable amount of exploration and development work was done on the property; the principal operators were the San Justo and Carson Creek Mining Companies. A 40-stamp mill was purchased from the nearby Melones mine, and $340,000 was spent on the property (Mining and Scientific Press, 7/30/98, p. 109). Apparently little work was done after 1904, and by 1914, all of the equipment had been removed (Tucker, 1916, p. 88). The value of the total output has been estimated by D. C. Demarest of Berkeley to be nearly $1,000,000.

The deposit consists of two main northwest-striking and northeast-dipping veins about 250 feet apart. Country rock in the vicinity of the veins is a series of metamorphosed sedimentary rocks partly correlated with the Cosumnes formation; just to the west are greenstones partly of the Logtown Ridge formation (Eric and Stromquist, 1955, plate I). The veins range from 15 to 30 feet in thickness. Ore mined in 1892 contained $5 to $15 per ton in gold. The sulfides, which amounted to about 3 percent of the total ore, contained $300 to $400 per ton in gold (Mining and Scientific Press, 7/9/92, p. 28). The ore shoot on the 700-foot level was 200 feet long and nearly 30 feet wide (D. C. Demarest, personal communication, 1957). Considerable amounts of tellurides were recovered during the early operations. The mine was developed by a 700-foot shaft. The first 75 feet was vertical, and the remainder was sunk at a 45-degree angle.

Carson Hill mines

Location: Secs. 13, 14, and 24, T. 2 N., R. 13 E., M.D.M., at Carson Hill between the towns of Carson Hill and Melones. Ownership: Fred G. Stevenot, 300 Montgomery Street, San Francisco 4, California.

Introduction. The mines at Carson Hill have been the largest source of lode gold in the county. Although records of early production are incomplete, these mines are credited with a total output valued at $26,000,000 (Bowen and Crippen, 1948, p. 55). The principal properties have been the Calaveras, Finnegan, Melones, Morgan, Reserve, and Stanislaus claims. Others include the Adelaide, Carson, Enterprise, Iron Rock, Irvine, Kentucky, May Day, Mayflower, McMillan, Mineral Mountain, Point Rock, Relief, South Carolina, and Union. Because of the complexity of the history of operations and various consolidations, all have been grouped together in a single article. The more important mines are described under subheadings in this article.

History. Although the region was prospected by placer methods as early as 1848, the Morgan mine, the earliest of the Carson Hill lode mines, was discovered in 1850. The following statements were made on the discovery by J. Ross Browne (1868, p. 59): "The discovery was made on the summit of Carson Hill, and the rock was extremely rich; indeed, if the statements of those who lived at the place are to be taken, the gold was abundant beyond parallel. Much of it was taken out in mortars, and not infrequently there were so many strings of gold in the rock that cold chisels had to be used to cut them. On one occasion gold to the amount of $110,000 was thrown down in one blast. The town of Melones, on the southern side of the Hill, became the largest mining camp in the State, with a population variously estimated at from 3,000 to 5,000. People came in crowds to see the mine. Robinson's Ferry, on the Stanislaus River, 2 miles south of the place, took in $10,000 for ferryage in six weeks. From February 1850 until December 1851, the production continued uninterrupted and with very

little decline. In that time (22 months), according to Thomas Deare, who has lived at the mine longer than any other person, $2,800,000 was extracted and immense sums stolen. It is reported of one Mexican miner that he stole $1,500 in one day from the arrastra which he had in charge, and spent it the next day for a horse. All the rock too poor for the hand mortar was ground in arrastras, ...The facilities for stealing were great and the temptation strong. Gambling was carried on to great extent, and gold seemed to have lost its value. The miners were mostly Mexicans, who, as a class, were not looked upon with favor by American miners; but they had had some experience in this kind of mining and their services were indispensable. They could pick up lumps of gold in the mine or they could take handfuls of amalgam from the arrastra with little fear of detection."

Photo 13. Mill of the Carson Hill Mining Corporation in 1940. Camera facing northwest. *Photo by Olaf P. Jenkins.*

In the first few years of operation the gold output was extremely high; nearly $3,000,000 was taken from the Morgan claim in less than two years (Knopf, 1929, p. 72). In November 1854, the largest mass of gold ever recovered in California, and one of the largest on record, was taken from Carson Hill. It weighed 195 pounds troy and was valued at $43,534. Assuming that the mass was 900 fine and recalculated at the present price of gold, it would be worth $73,710 (Bowen and Crippen, 1948, p. 55). Telluride minerals were recovered in quantity during the early period of mining at Carson Hill, chiefly from the Stanislaus mine. However, most were lost in unsuccessful attempts to extract the gold.

In the late 1850s, G. K. Stevenot, grandfather of the present owner of the mines, came into possession of the Morgan mine. A three-stamp mill was brought from England and erected near Carson Creek. This was the first quartz mill in the area, and although it was crude, milling results were satisfactory (Fred G. Stevenot, personal communication, 1957). It was destroyed in a flood in 1862. Soon afterward the Melones and Stanislaus Mining Company was organized with G. K. Stevenot as manager which worked the Melones and Stanislaus claims. By 1865, these two properties had been mined to a depth of 250 feet and a length of 400 feet (Mining and Scientific Press, 4/8/65, p. 211). The ore was dry-ground in a wooden tub-like device, and the concentrates were shipped to New York. Later an eight-stamp mill was erected on the property. In the meantime, the Finnegan mine on the northeast slope of Carson Hill, which had been discovered in 1857, was active.

During the late 1860s and early 1870s, the mines were idle much of the time as a result of lawsuits and milling difficulties. The Morgan and Melones mines were reopened in 1876 by the Melones Mining Company and operated intermittently through the 1880s. In 1889, an ore body 40 feet wide was discovered on the Calaveras claim (Mining and Scientific Press, 2/2/89, p. 74). In that year the Calaveras Consolidated Gold Mining Company, Ltd., an English concern, was organized and purchased the claims owned by the Stevenot family. The Calaveras vein was developed and a 20-stamp mill erected. This was the first operation in the area in which large low-grade ore bodies were mined commercially.

In 1895, the Melones Consolidated Mining Company was organized with Grayson and Boland as principal stockholders. This concern consolidated the Enterprise, Keystone, Last Chance, Melones, Mineral Mountain, Reserve, and Stanislaus claims and later the South Carolina. Under the superintendency of W. C. Ralston and later

Figure 5. Geologic map of the Corson Hill area.

W. G. Deveraux a large amount of development work was done including driving the Melones adit northwestward from the south side of the hill. A new mill was erected just east of the adit, and the first 60 stamps began dropping in 1902. The mill was increased to 100 stamps in 1905. Large quantities of ore were mined, the maximum having been 245,000 tons in 1918, the next to last year of operation by this concern. The total output of the Melones Consolidated Mining Company was valued at about $4,500,000 (Logan, 1935, p. 135). The ore was low grade, but mining and milling costs were lower than at any other mine on the Mother Lode belt.

Meanwhile in 1917, Carson Hill Gold Mines, Inc., was formed under the direction of W. J. Loring with A. D. Stevenot as mine superintendent. The old Morgan mine was purchased in 1918, and a new adit known as the Morgan adit was driven in a southerly direction from the north side of the hill. A new, rich ore body was encountered in schist in the hanging wall of the large massive "Bull" vein. This proved to be the upward extension of high-grade ore previously mined some 1300 feet below on the 1600-foot level (Knopf, 1929, p. 73). In the next few years this Hanging-wall ore body was mined to a depth of 4,550 feet and yielded more than $5,000,000. Additional properties were absorbed including those of the Melones Mining Company, and the name of the concern was changed to Carson Hill Gold Mining Company. A new 30-stamp mill was erected west of the highway and west of the old 100-stamp mill. This concern operated the properties until 1926. The value of the production for the 7 years of operation was $7,000,000 (Burgess, 1935, p. 112; 1937, p. 1-15; 1948, p. 89-90).

In 1933, the Carson Hill Gold Mining Corporation was organized by A. O. Stewart with J. A. Burgess as mine superintendent. The Morgan and Melones mines were rehabilitated to the 3000-foot level where newly discovered ore bodies in the footwall area were exposed. These were mined from that depth to the surface (Logan and Franke, 1936, p. 248). Eventually work progressed down to the 3500-foot level. The Calaveras mine was operated also. The capacity of the 30-stamp mill erected by the Loring interests was increased to 20,000 tons per month (Logan, 1935, p. 207). The Carson Hill Gold Mining Corporation continued operations until May 1942, when the mill was destroyed by fire. In this last operation 2,400,000 tons of ore were mined which yielded a total of $6,500,000 (Burgess, 1948, p. 90). The properties since were acquired by the present owner.

Geology. The geology of the Carson Hill area is complex—more so than any other portion of the Mother Lode (see fig. 5). The rocks consist essentially of north- to northwest-striking, northeast-dipping beds of phyllite, amphibolite and chlorite schist, and augitic tuff and breccia. The beds are intensely folded and faulted so there are abrupt variations in the nature of the rocks. The area has been intruded by small masses of gabbro and serpentine. Widespread hydrothermal alteration has transformed most of the serpentine into extensive bodies of mariposite-ankerite rock. Present in smaller amounts are talc and sericite schists.

The two principal vein systems are the Calaveras vein system on the west and the "Bull" vein system on the east. The Calaveras vein system usually is referred to as the main Mother Lode and the Bull vein system as an east branch of the Mother Lode (Knopf, 1929, p. 73).

The Calaveras vein system strikes northwestward, dips 60 degrees to the northeast, and has an average thickness of 10 to 15 feet. However, in some places it is as much as 100 feet thick. It consists of quartz with interspersed talcose gouge, talc and sericite schist, and extensive masses of ankerite with mariposite. Country rock in the vicinity of the vein system is talcose and pyritic schist. Ore mined from the Calaveras vein in 1919-20 yielded $3.88 in gold per ton (Knopf, 1929, p. 74).

The Bull vein system converges with the Calaveras vein system both to the south and north. The Bull vein has a north to northwest strike, an average dip of about 60 degrees to the northeast, and ranges from 1½ to 40 feet in thickness. To the south, it splits into two branches, the Stanislaus vein on the west and the Adelaide vein on the east. Both converge toward the Calaveras vein. The Bull vein is characterized by coarse white quartz that commonly exhibits chlorite-bearing ribbon structures. It rarely contains more than one-seventh of an ounce of gold (Knopf, 1929, p. 75), and much of it is nearly barren. The famous hanging-wall ore shoot was at a bend of the Bull vein in the Morgan and Melones mines. This shoot was mined from the surface to the 4,550-foot level. It averaged 175 feet by 15 feet in lateral dimensions, although there were considerable local variations. The bulk of the ore consisted of auriferous pyritic schist. Other minerals present were chalcopyrite, galena, tetrahedrite, petzite, and molybdenite, in various amounts. Ore from this shoot milled in 1919-20 yielded $11 to $14 of gold per ton at the old price (Burgess, 1937, p. 2). An ore body was mined also on the footwall at the bend of the Bull vein in the Morgan and Melones mines. This ore extended from the surface to the 2,170-foot level and consisted of pyrite-ankerite schist with abundant quartz stringers. The average value of this ore was $2 to $2.50 per ton in gold (Knopf, 1929, p. 76).

Additional ore bodies in the Morgan and Melones workings lay at the intersection of the Bull vein and a series of five flat-dipping veins known as the Flat veins (see fig. 7). The Flat veins have strikes of 30 to 40 degrees more westerly than the Bull vein and dips of 20 to 30 degrees to the northeast. They occupy reverse fault fissures that cut the Bull vein. The most productive ore shoot in this vein system was on the second lowest Flat vein between the 1100- and 1600-foot levels northeast of the Bull vein. Other ore bodies were associated with the Pink vein system encountered in the Morgan workings. It was a parallel system in the footwall, several hundred feet west of the Bull vein. The 195-pound mass of gold found in 1854 was from the Pink vein. Coarse native gold associated with petzite also was found in this vein.

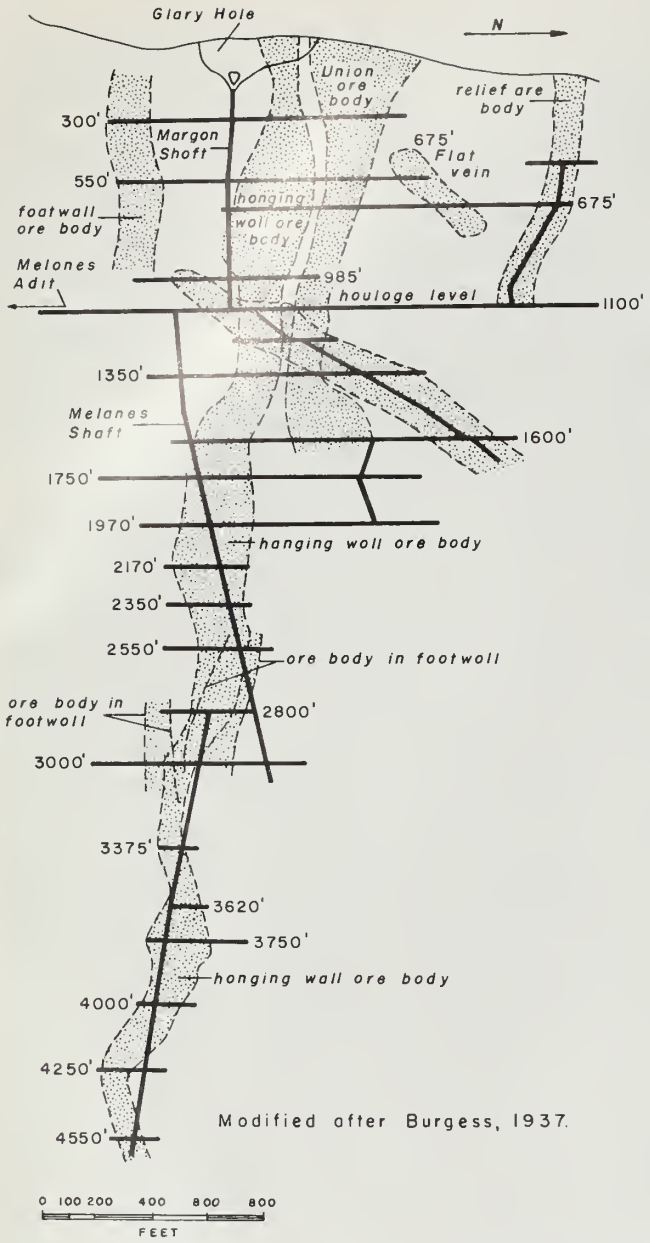


Figure 6. Longitudinol section of the Morgon-Melones gold mines ot Corson Hill.

The telluride minerals recovered in quantity during the early period of mining at Carson Hill were calaverite ($AuTe_2$), hessite (Ag_2Te), petzite ($(Ag_3Au)Te$), and sylvanite ($(Au,Ag)Te_2$). Melonite ($NiTe_2$), a very rare mineral found at the Melones and Stanislaus mines, was named after the town of Melones.

Mining and milling. The principal working entries were the Calaveras, Melones, and Morgan adits, the Morgan shaft, the underground Melones shaft or winze and the lower winze extending to the lowest levels (see fig. 6). The Melones adit, the portal of which is just above the town of Melones, was the main haulageway and is known as the 1100-foot level. The inclined Melones shaft or winze extends from the 1100-foot level to the 3000-foot level, and the lower winze extends from the 3000-foot to the 4500-foot level.

Several mining methods, both surface and underground, were employed at Carson Hill. Large quantities of ore were mined from glory holes north of the summit of Carson Hill. The great Morgan glory hole is visible from some distance north of the town of Carson Hill. Ore from the glory holes and the adjacent Union shovel pit was drawn through an ore pass to the 200-foot level and trammed to the Morgan ore pass, which was just east of the Morgan shaft, where it was delivered to the 1100-foot haulage level. The ore was hauled by electric trolley locomotives to the mill.

Much of the underground ore was mined from shrinkage stopes. The Flat veins were mined by open stoping with casual pillars. Square-set shrinkage stopes with subsequent waste filling were employed at the Calaveras mine (Burgess, 1937, p. 12).

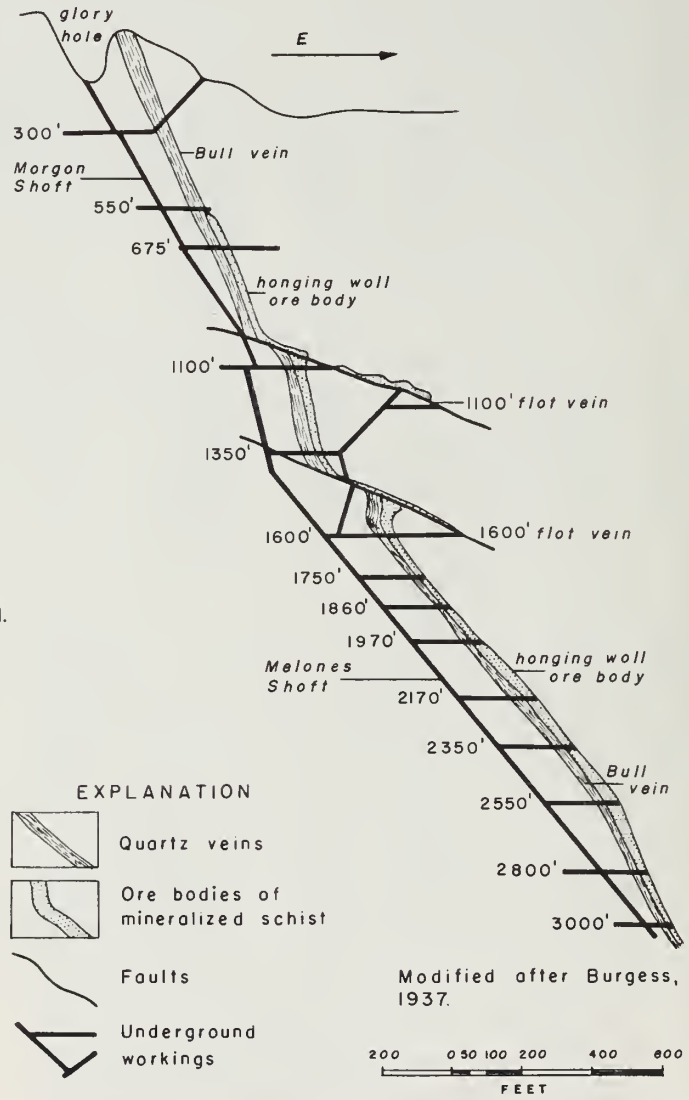


Figure 7. Cross section through the Morgon-Melones shofts ot Corson Hill.

Phata 14. Main apen cut at the Calaveras mine at Carsan Hill. Camera facing sauth. *Phata by Mary Hill.*

The two principal mills at Carson Hill were the 100-stamp Melones mill, which operated from 1902 to 1919, and the 30-stamp mill of the Carson Hill Gold Mining Corporation, which was in operation from about 1920 to 1926 and 1933 to 1942. Foundations of these mills remain at the property. At the Melones mill, which was operated by water power, the ore was sent through gyratory breakers, a crusher, and the stamps. The pulp was classified and concentrated on Wilfley tables and Frue vanners. Concentrates were sent to a cyanide plant. At the mill of the Carson Hill Gold Mining Corporation, the ore went through jaw crushers, stamps, and conical ball mills, and was concentrated on Deister tables. Concentrates were sent to the cyanide plant at the Melones mill. Mill tailings were delivered by flume to the disposal area just east of Coyote Creek where an enormous pile now remains.

Calaveras mine. The Calaveras mine, which was also known as the Calaveras Consolidated, orginially consisted of several claims of which the Calaveras and Santa Cruz were the most important. The property is on the southwest slope of Carson Hill west of the Melones mine. Large-scale mining of low-grade ore bodies in the Carson Hill area began at the Calaveras mine soon after 1889. The mine was a major source of ore during the latter part of the operations of the Carson Hill Mining Company, 1918-26. During the operations of the Carson Hill Mining Corporation, 1933-42, it was mined extensively both underground and in open cuts.

The mine is developed by the 1500-foot Calaveras adit, the portal of which is just west of State Highway 49 at Melones; several raises, and two open cuts on the adjacent northern slope, known as the north and south pits. These workings are on the Calaveras vein system which is described in the section on geology.

Finnegan mine. Located on the northeast slope of Carson Hill between the Reserve and Boston Consolidated claims, the Finnegan mine was operated separately from the other Carson Hill mines during much of its history. The mine was discovered in 1856 by John Finnegan. In 1867 a small rich ore shoot that yielded $80,000 to $100,000 was encountered on the property (Mining and Scientific Press, 6/15/67, p. 374). During the latter part of the 19th Century, the mine was almost continuously active. In 1894 it was being worked on a small scale for pockets (Crawford, 1894, p. 92). In the early 1900s, the mine was worked chiefly by open-pit method, and in 1910 a $10,000 pocket was discovered.

The open cuts of the Finnegan and the adjoining Reserve claim of the Melones Mining Company finally joined and a suit against the latter concern resulted. From about 1920 until about 1931, the mine was operated by Lewis, Gilman, and Moore. Apparently it has been idle

since. The output since 1897 has been valued at more than $120,000 (Logan, 1935, p. 139).

The ore body consisted of mineralized amphibolite schist as much as 100 feet thick on the footwall of the Bull vein. This was developed by the open cut that now is part of the large Morgan glory hole, and two adits. To the east a narrow west-dipping quartz vein was developed by a 350-foot inclined shaft.

Melones mine. This mine consisted of the eight claims consolidated by the Melones Mining Company in 1895 and operated as a unit until 1919. They extend from the summit of Carson Hill south to the river and are on and east of the Bull vein. All of the claims had earlier histories, and some—such as the Reserve, which had yielded $160,000 by 1868, and the Stanislaus, from which large amounts of teluride minerals were recovered—were rich. However, the Melones mine was best known for the large quantities of low-grade ore mined and milled at low costs. The main working entry was the Melones adit which extended 5000 feet from portal to workings.

Morgan mine. Located on the northwest slope of Carson Hill, the Morgan mine probably has been the source of the largest amount of gold in the area. Discovered in 1850 it had yielded at least $2,800,000 by the end of 1851. In 1854 a large mass of gold was found on the property. The mine was active during the 1860s. It was idle during much of the following period until 1918, when it was acquired by the Carson Hill Gold Mining Company. In driving the Morgan adit the famous Hanging-wall ore shoot was discovered, consequently the Morgan and the adjoining Melones mine were major sources of ore from 1920 to 1926. This mine was again highly productive during the operations of the Carson Hill Gold Mining Corporation (1933-42). The principal working entries were the Morgan adit, the Morgan shaft, and the immense Morgan glory hole.

Centennial (New Champion) mine

Location: NW¼ sec. 4, T. 6 N., R. 13 E., M.D.M., 1½ miles northwest of West Point. Ownership: New Champion Mining Company, c/o H. G. O'Hanlon, West Point, California.

The Centennial gold mine was worked from 1937 to 1940 (U. S. Bureau of Mines records). In 1946, it was reopened by the present owner and operated continuously until 1950. Except for 1954, when some gold was produced from a mill cleanup, the mine has been idle since.

The quartz vein strikes N. 15° W., dips 50° SW., and averages 6 feet in thickness. The ore contains free gold, pyrite, and smaller amounts of chalcopyrite, galena, and sphalerite. Ore mined during the period of 1947-50 contained an average of $33 per ton in gold, and the sulfide concentrate contained as much as $575 per ton (H. G. O'Hanlon, personal communication, 1955). Several ore shoots were developed which pitch in a southeast direction. Country rock is granodiorite. There is a dike of medium-grained diorite along the footwall of the vein.

The mine is developed by a 200-foot inclined shaft with levels at 100 and 200 feet and a 55-foot inclined shaft about 400 feet to the southeast. At the 100-foot level a drift was run 90 feet southeast. At the 200-foot level drifts were run 650 feet southeast and 350 feet northwest. About 350 feet southeast of the main shaft on the 200-foot level, a winze was sunk to the 300-foot level. On the latter level drifts extend 350 feet to the southeast and 50 feet to the northwest. Most of the stoping has been on the 200-foot level and above. One of the stopes is connected with the 55-foot shaft.

The ore was treated in a 40-ton mill which remains on the property. It is equipped with a jaw crusher, ball mill, rake classified, Knudsen bowl, and four flotation cells.

Champion (Haskins) mine

Location: SE¼ sec. 4, T. 6 N., R. 13 E., M.D.M., 1 mile due west of West Point. Ownership: Josephine Ruffino and Rose Canevaro, 579 Greenwich Street, San Francisco, California.

One of the more productive lode gold mines in the West Point district, the Champion was active during the 1870s and early 1880s. The output was as much as $5000

Photo 15. Centennial or New Champion gold mine and mill, West Point district. Camera facing northeast.

per week from ore containing up to $100 per ton in gold (Mining and Scientific Press, 1/29/76, p. 69, and 9/28/78, p. 196). By 1882, the value of its total output was reported to have been $190,000 (Mining and Scientific Press, 5/6/82, p. 308). The mine was active again in 1898. Although the total production is unknown, its value has been estimated at about $500,000 at the old price (Logan, 1923a, p. 18).

The deposit consists of a lens-shaped quartz vein within a diorite dike. Both strike northwestward and dip 35 to 65 degrees to the southwest. Country rock is granodiorite. The main ore shoot ranged from 10 inches to 4 feet in width, had a stope length of 90 feet, and was mined to a depth of 700 feet. It was cut off both to the north and south by parallel northeast-striking fissures. A 100-foot drift was driven along the northeast fissure on the 400-foot level, and rich ore containing free gold and galena was encountered (Logan, 1923a, p. 18). The main shaft is 900 feet deep. Little ore was encountered on the lowest levels. The ore was treated in a stamp mill. The shaft is caved, and no equipment remains on the property.

Collier (Blood, Sandwich) mine

Location: S½ sec. 1, T. 3 N., R. 14 E., M.D.M., on ridge north of the Stanislaus River 5 miles due east of Murphys and 1 mile west of the Stanislaus power house. Ownership: Sterling Carter, Murphys, California.

This mine, which was the chief source of gold in the old Collierville mining district east of Murphys, was discovered in 1878. Soon afterward a five-stamp mill was erected, and the output was valued as high as $6000 per month (Mining and Scientific Press, 10/5/78, p. 212). The mine was worked almost continuously until 1899. It was active again in 1925 and 1926 with a small output (Logan and Franke, 1936, p. 249). At the present time the owner is intermittently prospecting the surface and has made several cuts with a bulldozer.

The main quartz vein strikes in a westerly direction and has a dip of 80° north. The quartz is dark in color and contains abundant sulfides including pyrite, galena, sphalerite, arsenopyrite, and stibnite. Tellurides also were reported to be present (Tucker, 1916, p. 74). Country rock is hard siliceous slate and quartz-mica schist of the Calaveras group which strikes almost due west. The mine is developed by seven west-trending drift adits ranging from 160 to 400 feet in length, and related raises and winzes. An aerial tramway was used to deliver ore from the adits to the mill. The workings are partially accessible, but all equipment has been removed.

Commodore (Golden Gate) mine

Location: Sec. 7, T. 4 N., R. 12 E., M.D.M., on Mother Lode 1 mile northwest of San Andreas and west of State Highway 49. Ownership: Commodore Gold Mining Company, c/o Jones and Quinn, Wilhoit Building, Stockton, California.

The Commodore or Golden Gate gold mine was active prior to and during the 1870s when it was worked through a 450-foot adit (Logan, 1935, p. 137). In 1899-1900, the Commodore Gold Mining Company was organized and reopened the mine. A shaft was sunk and several hundred tons of ore milled. Thereafter it lay idle until 1933 when an option was obtained by the Best and Belcher Mining Company of San Francisco, which also was developing the Everlasting mine south of San Andreas. The workings were rehabilitated and some development work was done on the 200-foot level. Operations ceased in 1934, and apparently the mine has been idle since.

A cross-section of the deposit is shown in figure 31, California Mining Bureau Bulletin 18 (Storms, 1900, p. 106). From west to east the formations are: amphibolite schist, ankerite, a quartz vein; a wide body of ankerite; serpentine; a mineralized quartz diorite intrusion, which is known as the Commodore vein; serpentine and diabase. The beds strike northwestward and dip to the northeast. On the hanging wall side of the quartz diorite intrusion is a 4-foot zone of crushed material from which rhombic crystals of dolomite containing visible particles of gold were recovered. Ore milled in 1900 contained an average of $4 per ton in gold, but some $7 ore was encountered to the north on the 300-foot level.

The mine is developed by a 300-foot shaft sunk in the footwall. The shaft is vertical for the first 80 feet, and inclined 75 degrees the remainder of the distance. There are levels at 80, 200, and 300 feet, from which crosscuts extended to the vein.

Demarest mine

Location: NE¼ sec. 16, T. 3 N., R. 12 E., M.D.M., just west of San Domingo Creek 1 mile southeast of Fourth Crossing and 7 miles southeast of San Andreas. Ownership: M. H. Manuel, Murphys, California.

This Mother Lode gold mine was originally worked in the 1850s (Logan, 1935, p. 138), and in the late 1860s it was reported to have had a large output (Mining and Scientific Press, 12/13/99, p. 723). It was worked also from 1897 to 1901 and again in 1904 by the Demarest Gold Mining Company, D. C. Demarest, Berkeley, president. The shaft was sunk to a depth of 600 feet, and the ore was treated in a five-stamp mill. The production for these years was valued at $40,000 at the old price of gold (Logan, 1935, p. 138).

From 1924 to 1937 several concerns operated the mine, including the Bear Mountain Development Company, Cherokee Development Company, and Alaska B. C. Gold, Incorporated. The mill was increased to 10 stamps, but only a small amount of ore was mined and milled. The mine was last worked in 1938-39 by E. J. Young of Angels Camp and has been idle since. The total output of the mine is estimated to have a value of about $75,000 at the old price of gold (D. C. Demarest, personal communication, 1957).

There are three quartz veins on the property, but all of the work has been confined to the middle vein. It

strikes in a northwesterly direction, dips to the northeast, and ranges from 6 to 10 feet in thickness. Country rock is slate, phyllite, and smaller amounts of green schist. Gouge accompanies the vein on the hanging wall side north of the shaft, but some distance south of the shaft there is a flexing in the vein walls and the gouge passes over to the footwall side (Storms, 1900, p. 107). Present also are dikes of medium-grained diorite. The ore shoot south of the shaft had an average stope length of 225 feet and contained an average of $8 to $9 per ton at the old price of gold. It has an hour glass shape as viewed laterally, the narrowest portion being on the 500-foot level (D. C. Demarest, personal communication, 1957).

The mine is developed by a 690-foot 60-degree inclined shaft, with levels at 100, 300, 400, and 600 feet. Drifts range from 300 to 420 feet in length, and all have been driven south from the shaft. Besides the 10 stamps, the mill was equipped with amalgamation plates and Frue vanners. The shaft is caved and all equipment has been removed from the property.

Dutchess Consolidated mine

Location: SE¼ sec. 5, NW¼ sec. 9, T. 2 N., R. 14 E., M.D.M., on ridge above Stanislaus River 1 mile northeast of the Vallecito-Columbia road. Ownership: Dutchess Consolidated Mining and Milling Company, 653 American Avenue, Long Beach, California.

The Dutchess mine consists of the Dutchess, Grand Dutchess, Hoosier Dutchess, and Little Dutchess claims. The mine was under development in 1900 under the direction of G. H. Lewis (Mining and Scientific Press, 10/20/00, p. 469). In 1905 the lower adit had been driven a distance of 1,824 feet, and ore was being treated in a 10-stamp mill. The Stanislaus Mining Company was formed to operate the property at this time (Mining and Scientific Press, 3/11/05, p. 157). Soon afterward, the mine was shut down and except for a small recorded output in 1914 remained idle until 1935. In that year the Dutchess Mining Company of Angels Camp was organized. The lower adit was rehabilitated and some ore was mined during the next two years. The mine was shut down in 1937. During the past few years some surface prospecting has been done just north of the property by L. W. Bates of Columbia. The value of the total output is unknown.

The main quartz vein, which ranges from 3 to 11 feet in thickness, has a northeast strike and an average dip of 75° NW. Country rock is granodiorite with mica and quartz-mica schist just to the west; limestone of the Calaveras formation lies to the north. The ore contains appreciable quantities of sulfides—as much as 8 percent pyrite was present in ore mined in the past (Tucker, 1916, p. 76). There are a number of narrow stringers that have yielded small but high-grade pockets.

The mine is developed by three drift adits, the upper being 400, the middle 475, and the lower more than 1800 feet in length. The 10-stamp mill, the remains of which are on the property, was equipped with a jaw crusher, amalgamator, and a concentrating table. There was a cyanidation plant also.

Easyz Bird (Big Pine, Le Roi) mine

Location: S½ sec. 6, T. 5 N., R. 12 E., M.D.M., 1 mile northeast of Mokelumne Hill. Ownership: Wah Chang Mining Corporation, 137 Clarke Street, Bishop, California.

The Easyz Bird gold mine was worked from 1898 to 1907 and again from 1914 to 1917 (Logan, 1925, p. 152). The mine was reopened in 1931 (Logan and Franke, 1936, p. 252). From 1933 to 1938 it was operated by the Lucky Joe Mining Company. Between 1938 and 1942 the mine was operated by Le Roi Mines, Inc. From 1934 to September 1936 the output was more than 8,000 ounces of gold and 2,000 ounces of silver (Julihn and Horton, 1938, p. 120). The mine has been idle since 1942.

The Easyz Bird vein has a strike of N. 70° E., dips of 65°-80° SE., and ranges from 2 to 40 feet in thickness. The hanging wall is granodiorite, and the footwall is slate. In addition to the Easyz Bird vein, there are several other parallel and intersecting veins (Logan and Franke, 1936, p. 252). Ore shoots, generally 15 to 20 feet wide and 100 to 360 feet long, were formed at vein intersections (Julihn and Horton, 1938, p. 120). The gold is contained chiefly in the pyrite, although rich pockets of native gold occasionally were found. The average value of the ore was $4 to $6 per ton in gold, and the gold to silver ratio was 4 to 1.

The mine is developed by a 303-foot vertical shaft with crosscuts to the vein at 100, 200, and 300 feet. Drifts on these levels extend about 1100 feet northeast and 900 feet southwest. The 100-foot level is connected with a south-trending adit. The shaft is open. Shrinkage stope mining methods were employed.

The ore was treated in a 125-ton flotation mill which remains on the property. Mill recovery was about 94 percent, and the concentration ratio was 34 to 1. The concentrates, which contained an average of 4.3 ounces of gold per ton, were shipped to the Amador Metal Reduction Company at Jackson for cyanidation. The mill contains a primary gyratory crusher, ball mill, rake classifier, five flotation cells, thickening cone, and a disc filter.

Economic (Cuneo) mine

Location: NW¼ sec. 34, NE¼ sec. 33, T. 4 N., R. 13 E., M.D.M., on south side of San Antonio Creek 1 mile due south of Fricot School and half a mile north of Esmeralda School. Ownership: Raymond Cuneo, San Andreas, California.

The Economic gold mine was one of the more productive properties of the old Esmeralda mining district. It was worked prior to and during the 1880s. After lying idle for some years, the mine was leased in 1910 by the Standard Amalgamated Exploration Company of Boston, Massachusetts. A 20-stamp mill was erected, and a considerable amount of ore was mined and milled (Raymond Cuneo, personal communication, 1958). Operations

ceased in 1918, and except for surface prospecting, the mine has been idle since.

This property is located on the Esmeralda vein system. This system consists of at least three parallel major veins which range in strike from due west to N. 85° W. and dip steeply to the north. The Chaparral mine is located on the most northerly of the three veins, the Economic and the Basco mines are on the central vein, while the Bonehard, K. and J., Esmeralda, and Bence mines are on the south vein (see Clark, 1954, plates 1 and 2). The vein at this mine has an average thickness of 6 feet, strikes nearly due west, and dips 75° N. The ore contained free gold and abundant sulfides; considerable amounts of leaf gold were recovered from high-grade ore in the upper portion of the deposit. Country rock is graphitic slate and mica schist containing numerous bodies of talcose schist.

The mine is developed by a 700-foot southeast crosscut adit to the vein from which nearly 1000 feet of drifts extend east on several levels and sub-levels. The 20-stamp mill was equipped with a crusher and Frue vanners which were driven by water power (Tucker, 1916, p. 77). All equipment has been removed from the property.

Empire (Cleveland, Jumbo, Uno) mine

Location: Sec. 30, T. 2 N., R. 12 E., M.D.M., 1 mile west of Hodson and 3 miles northwest of Copperopolis. Ownership: Effie M. Tower, Farmington, California.

The Empire gold mine was active from the 1870s (Mining and Scientific Press, 7/21/83, p. 36) through the 1890s (Crawford, 1896, p. 103). It was reopened in 1935 by the Empire Mining Syndicate of San Francisco and worked until 1939 by this concern and William A. Hess of Copperopolis. It has been idle since 1939.

Native gold, auriferous pyrite, and minor amounts of galena and sphalerite are in a vein that strikes N. 50° W. and dips 20° NE. A basic dike, which is auriferous in part, and veins of calcite are associated with the vein. Many stringer quartz veins intersect the main vein. The hanging-wall is chloritic schist of the Logtown Ridge formation, and the footwall is black Mariposa slate. The value of the ore ranged from $5 to $8 per ton (Logan and Franke, 1936, p. 254). The mine is developed by a 300-foot inclined shaft with levels at 25, 100, and 225 feet which include about 800 feet of drifts. There is also a 100-foot shaft on the property.

Esmeralda mine

Location: Sec. 34, T. 4 N., R. 13 E., M.D.M., half a mile east of Esmeralda School on ridge north of Indian Creek. Ownership: John F. Davis estate, c/o John P. Davis, 38 Sansome Street, San Francisco, California.

This gold mine was worked on a major scale beginning in 1885. In 1886-87, it was reported to have yielded more than $1000 per week from ore that contained an average of $32 per ton (Mining and Scientific Press, 4/24/86, p. 280, and 2/19/87, p. 128). The shaft was 250 feet deep, and the ore was treated in a 10-stamp mill (Irelan, 1888, p. 133). Operations continued through the 1890s until sometime around 1900. The mine apparently has been idle for many years. The value of its total output is unknown, but several local residents estimate it to be in excess of $300,000.

The vein strikes nearly due west, dips 68° N., and is 3 to 4 feet thick. The ore contains free gold, with some sulfides. The country rock is graphitic slate containing numerous bodies of talc. Just to the south is green schist. The mine is developed by a 430-foot inclined shaft and at least 500 feet of drifts. The 10-stamp mill was equipped with a Frue vanner. All equipment has been removed from the property.

Etna (Aetna, McKisson)

Location: SE¼ sec. 18, T. 6 N., R 13 E., 1¼ miles due north of Glencoe by the South Fork Mokelumne River. Ownership: Calvin Snyder, Stockton, California; leased by O. C. Brink and E. J. Nuhn, P. O. Box 1021, Stockton.

This gold mine was active prior to and around 1914 (Tucker, 1916, p. 66). It was reopened in 1933 by Consolidated Mines of California (Logan and Franke, 1936, p. 274) and operated until 1938. The mine was reopened again in 1951 by the present lessees and has been intermittently worked since.

There are two nearly east-striking and south-dipping quartz veins. The ore, which contains free gold and considerable quantities of sulfides, is in steeply plunging lens-shaped shoots in the vein. Its value averaged $20 to $40 per ton (O. C. Brink, personal communication, 1957). Country rock is granodiorite.

The mine is developed by a 1100-foot lower adit extending southward and several shorter upper adits. An air raise connects the lower adit with the surface. There is a 10-stamp mill on the property.

Everlasting (Sceiffard) mine

Location: Secs. 19 and 20, T. 4 N., R. 12 E., M.D.M., 1 mile south of San Andreas on west side of the Kentucky House road. Ownership: C. J. Tiscornia, San Andreas, California.

This gold mine was originally located about 1867 by John Sceiffard (Mining and Scientific Press, 7/9/87, p. 24). The mine was intermittently active during the 1870s, 1880s, and 1890s. In 1900, it was developed by a 225-foot shaft and a 200-foot open cut (Kerr, 1900). In 1935 the Best and Belcher Company, which was prospecting the Commodore mine north of San Andreas, leased the property and sank a new shaft north of the old one. According to an article that appeared in the San Francisco Chronicle November 23, 1939, this operation was still continuing, and the new shaft had reached a depth of 310 feet. The value of the total output of the mine is unknown.

This deposit is one of several located on an irregular vein system in the San Andreas area of the Mother Lode which strikes northwestward and dips to the northeast. Much of the quartz has been crushed and mixed with gouge, and the gouge is heavy on both walls (Fairbanks,

1890, p. 63). The hanging wall is serpentine and the footwall is greenstone. Just to the east is amphibolite and to the west are metasedimentary rocks of the Calaveras formation. The vein ranges from 8 to 14 feet in thickness. Ore mined in 1935 yielded $3.50 to $16 per ton (Logan and Franke, 1936, p. 243).

Fellowcraft (Bode, Veritas) mine

Location: E½ sec. 17, T. 4 N., R. 12 E., M.D.M., just east of San Andreas. Ownership: C. J. Tiscornia, San Andreas, California.

This Mother Lode gold mine was discovered in 1852 (Mining and Scientific Press, 5/2/85, p. 288) and worked intermittently during the 1860s, 1870s, and 1880s. In 1893 it was reported to have had a total output of $100,000 (Preston, 1893, p. 178). The mine was active in 1900, and the ore was treated in a 10-stamp mill (Storms, 1900, p. 106). Apparently the last year of operation was in 1907 when the output was less than $1000 (Logan, 1935, p. 139).

There are two principal vein systems 100 to 135 feet apart. Each consists of a series of quartz stringers containing free gold and sulfides. The west vein averages 2 feet in thickness and the east vein 4 to 8 feet. The veins strike northwestward and dip to the northeast. Country rock is amphibolite and chlorite schist and just to the east is Calaveras slate. The mine is developed by a 230-foot inclined shaft sunk on the west vein with levels at 50, 100, and 200 feet. On the 100- and 200-foot levels, crosscuts extend to the east vein. There is also an adit on the west vein. The 10-stamp mill was equipped with Frue vanners and Wilfley table.

Fidelity mine

Location: SE¼ sec. 30, T. 6 N., R. 13 E., M.D.M., three-quarters of a mile due south of Glencoe. Ownership: E. E. Allen, 145 Persia Street, San Francisco, California.

The Fidelity gold mine was active in 1882 and again in 1889 when it had been developed to a depth of 200 feet (Mining and Scientific Press, 4/20/89, p. 276). No data are available on subsequent operations until 1934 when it was reopened by E. Gilomen of Mokelumne Hill (Logan and Franke, 1936, p. 255). The property was partially rehabilitated, a 15-ton mill erected, and apparently some ore was mined. This operation ceased after 1936, and the mine lay idle until 1952 when it was acquired by the present owner. Since then it has been worked intermittently on a small scale by a partnership consisting of Mr. Allen and Paul DeRoss of Glencoe. A new 40-foot shaft has been sunk near the lower adit portal and about 30 feet of drifting to the south has been done.

Native gold, pyrite, some chalcopyrite, and small amounts of galena are in a north- to northwest-striking, east-dipping quartz vein that ranges from 1½ to 6 feet in thickness. Country rock in the vicinity of the vein consists of graphitic slate, dark dense quartzite, and mica schist. Present also are dark dense fine- to medium-grained diorite dikes. Ore taken from the new shaft contained $25 to $30 per ton in gold (E. E. Allen, personal communication, 1955). Besides the new 40-foot shaft, the mine is developed by a 150-foot lower drift adit; a 200-foot south drift adit 80 feet above the lower adit; and a 400-foot north drift adit which is caved. To the south there is also an old 200-foot shaft which is now caved.

Fine Gold mine

Location: S½ sec. 29, T. 6 N., R 14 E., M.D.M., 3½ miles due east of Railroad Flat. Ownership: W. P. Caubu, c/o F. R. Drinkhouse, 1257 Shrader Street, San Francisco, California.

This gold mine was first worked in 1883 by John Gilman, and for a few years following, it was the source of considerable amounts of gold. By 1886 it had been developed to a depth of 250 feet (Logan and Franke, 1936, p. 255), and the ore was being treated in a 10-stamp mill. The mine was idle during the 1890s. The property was active from 1906 to 1910 and again from 1915 to 1924. The mine was reopened in 1934 by the Western Pacific Gold Mining Company, and in 1935 it was leased to the Fine Gold Mining Company of Los Angeles, Horace Taylor, president. A new mill was built, and the property was operated almost continuously until 1941. Some work was done in the mine during the period 1948-49 by the Fine Gold Mining Company, but it has been idle since. The dump was recently used as a source of fill material for road construction. The value of the total output is estimated to be about $200,000 (Clemens Roark, personal communication, 1959).

The quartz vein strikes north, dips 75° W., and averages 5 feet in thickness. The quartz ranges from milky white to dark gray in color and contains abundant sulfides including pyrite, chalcopyrite, and arsenopyrite. Closely associated with the vein are several dikes of buff-colored fine-grained diorite. The footwall is graphitic slate and schist, and the hanging wall is fine-grained hornfels. The value of the ore mined during the 1880s was reported to have averaged $20 per ton (Mining and Scientific Press, 11/21/85, p. 344), but that mined during the 1930s was about $7 per ton (Logan and Franke, 1936, p. 255). However, some ore containing as much as $30 per ton was reported to have been mined during the last period of operation (Clemens Roark, personal communication, 1959).

The mine is developed by the Main Fine Gold 250-foot inclined shaft with levels at 100 and 200 feet. A considerable amount of drifting has been done and most of the workings are open. The 50-ton mill, which remains on the property, contains a jaw crusher, ball mill, rake classifier, flotation cells, thickener, filter, and table. Besides the mill building and hoisting shed, there are a number of other buildings on the property.

Ford (Apex) mine

Location: SE¼ sec. 17, T. 4 N., R. 12 E., M.D.M., half a mile east of San Andreas. Ownership: Mrs. Ann Dower, W. W. and Edith Steele, c/o W. W. Steele, Jackson, California.

The Ford mine was originally worked prior to the 1890s when considerable amounts of gold were sluiced from the surface (Crawford, 1896, p. 104). During the 1890s, the Ford brothers sank a 120-foot vertical shaft. Later the Ford Gold Mining Company was organized to work the property. A 700-foot shaft was sunk north of the old shaft, and a 10-stamp mill was erected (Storms, 1900, p. 108). This work ceased about 1900, and the mine was idle until 1914-15 when some prospecting work was done (Tucker, 1916, p. 80).

In 1922 the mine was reopened by the Apex Mining Company. This company and other concerns operated the mine intermittently during the 1920s and 1930s. In the late 1930s the mine was operated by James B. Ferguson of Long Beach, California who erected a mill and began sinking a new shaft. The mine has been idle since.

The deposit is in a series of complexly folded beds of chloritic and amphibolitic schists (Knopf, 1929, p. 71). Black slate, talc schist, hornblendite, limestone, and garnetiferous white schist are present also. Four northwest-striking veins are on the property—the west vein, 120 feet west of the main shaft; the main vein on which the main shaft was sunk; the hanging wall vein; and the east vein, which crops out 270 feet east of the main shaft. The east and west veins were the richest and the latest work was concentrated at these localities (Logan, 1935, p. 139). The west vein is about 4 feet thick, and the east vein is a belt of quartz stringers 20 feet thick. The ore contains variable amounts of pyrite and smaller amounts of other sulfides. At one time hessite, petzite, and some rich gold specimens were recovered from the main vein. In the last operation the value of the mill heads ranged from $5 to $8 per ton (Logan, 1936, p. 257).

The mine is developed by a 750-foot inclined shaft sunk on the main vein with levels at 100, 200, 300, 400, and 700 feet; a 120-foot vertical shaft 300 feet south of the main shaft; and several thousand feet of drifts and crosscuts. The mill used in the last operation was equipped with a Hadsel impact breaker, a jig, and two flotation cells. It treated about 30 tons of ore per day. All equipment has been removed.

German Ridge and Jupiter mine

Location: Secs. 15 and 16, T. 3 N., R. 13 E., M.D.M., 2½ miles northeast of Angels Camp. Ownership: German Ridge and Jupiter Gold Mines Corporation, c/o Mrs. M. M. E. Johnson, Angels Camp, California.

The German Ridge and Jupiter gold mine originally was active prior to 1889 (Brown, 1890, p. 149). By 1914 sporadic superficial work had been done in search of high-grade pockets (Tucker, 1916, p. 80). Some work was done on the property from 1931 to 1934. In 1933 and 1934, between $14,000 and $16,000 worth of gold was produced (Logan and Franke, 1936, p. 259). The quartz vein strikes in a northwest direction, dips steeply to the northeast, and ranges from 2 to 10 feet in thickness. Associated with the vein is schist interlaced with many quartz veinlets. The mine is developed by a 140-foot shaft with a level at 55 feet where drifts were driven 80 feet to the northwest and 150 feet to the southeast. The ore was treated in a five-stamp mill.

Gold Cliff mine

Location: SE¼ sec. 33, T. 3 N., R. 13 E., M.D.M., just west of Angels Camp. Ownership: Utica Mines, Inc., 220 Montgomery Street, San Francisco, California.

One of the better-known Mother Lode gold mines in the county, the Gold Cliff mine was discovered in 1850. The Utica Gold Mining Company gained control of the property in 1884 and operated it in conjunction with other mines until 1920. The value of the output for this period of operation was $2,834,000 (Logan, 1935, p. 141). Except for sampling the open cut in the 1930s, the mine has been idle since 1920.

The deposit is in the main Mother Lode belt and consists of mineralized chlorite and amphibolite schist cut by numerous quartz veins and veinlets. The ore body was as much as 100 feet thick. It strikes northwestward and dips to the northeast; at depth the dip flattens to as little as 7 degrees. The gold was associated with sulfides in the schist and quartz. The average value of the ore as mined ranged from $2.00 to $2.50 per ton and the sulfide concentrate from $30 to $50 per ton. In the upper workings the immediate hanging wall of the ore body was a massive barren quartz vein. At depth the hanging wall was hard, grooved amphibolite schist that stood without timbering and was a major factor in permitting low-cost mining operations (Logan, 1935, p. 140). Between the 1600- and 1700-foot levels, a nearly horizontal fault of several hundred feet displacement offsets the ore body to the north. The Gold Cliff vein system intersects the Utica vein about 2700 feet below the surface in the Utica workings, but no high-grade ore was encountered at this intersection (Knopf, 1929, p. 72).

The mine is developed by an open cut and a 1700-foot inclined shaft; only a portion of the underground workings is shown in figure 10. A 270-foot inclined winze was sunk from the 1700-foot level. A northeast crosscut on the 1400-foot level is connected with 1500-foot level of the Utica mine. Open stopes with pillars were employed; little timbering was required. The ore was treated in a 200-ton mill equipped with a Blake crusher, 40 stamps, and 24 Frue vanners. No equipment remains on the property.

Golden Hill mine

Location: Sec. 1, T. 4 N., R. 11 E., M.D.M., 3½ miles northwest of San Andreas on the Judd Ranch. Ownership: Lookout Mining Company, 33 California Street, San Francisco, California.

This mine is on the Mother Lode gold belt half a mile north of the Lookout Mountain mine and near the crest of a ridge. It was active during the 1870s when rich ore was reported to have been mined (Mining and Scientific Press, 3/3/77, p. 133). In 1896 the mine was developed by two shafts, 60 feet and 100 feet deep (Crawford, 1896, p. 106). Although there are no published records, the mine was worked on a major scale following 1896. Exten-

sive dumps indicate considerable development work, and according to several local residents, the mine had a large output. During the 1930s ore was mined from open cuts north and south of the main shaft and treated in the mill at the Lookout mine (Logan and Franke, 1936, p. 270). Apparently the mine has been idle since.

The ore zone, which is as much as 8 feet thick, consists of quartz and mineralized schist. It strikes N. 30° W. and dips to the northeast. Country rock is slate and fine-grained chloritic schist. The ore contains free gold and auriferous pyrite. Ore milled in 1936 had a value of $1.70 to $3.50 per ton, and the concentrates averaged $90 per ton (Logan and Franke, 1936, p. 270). The mine is developed by a main 350-foot inclined shaft that is partially open, two other open shafts 50 and 200 feet to the southeast, and several open cuts. No equipment remains at the mine, but a large mill building stands to the east at the junction of the roads to this property and the Lookout Mountain mine.

Gold Hill mine

Location: NW¼ sec. 32, T. 3 N., R. 13 E., M.D.M., 1 mile due west of Angels Camp and just north of State Highway 4. Ownership: Charles C. Crespi et al., Angels Camp, California.

This Mother Lode gold mine was originally worked during the early days of the gold rush when $100,000 was recovered from surface pockets (Mining and Scientific Press, 7/9/92, p. 28). After lying idle for some years it was reopened about 1890 by the Gold Hill Mining Company and operated until sometime around 1902. During this operation considerable amounts of ore were mined and treated in a 20-stamp mill.

After 1902, the mine was mostly idle. In 1936 it was leased by the Belmont-Osborn Gold Mining Company (Logan and Franke, 1936, p. 242). This concern rehabilitated the main working entries and mined some ore, which was treated at the Belmont-Osborn mill half a mile to the northwest. Later several individuals prospected the upper workings in search of high-grade pockets. At present, intermittent surface prospecting work is being done on the property. One prospect hole some 400 feet west of the shaft collar is 20 feet wide and has exposed a 10-foot zone of parallel quartz stringers that contains abundant iron oxide and small amounts of free gold. Dump material is occasionally used as road fill.

The vein, which ranges from 10 to 30 feet in thickness, has a strike of about N. 35° W., and dips 60-70° NE. Country rock is chloritic amphibolite schist, dark massive fine-grained greenstone, and smaller amounts of phyllite and slate. The mine is developed by a steeply inclined 330-foot shaft with levels at 165 and 300 feet; and two adits, one a crosscut adit just to the west of the shaft, and a drift adit, the portal of which is some 200 yards southeast of the shaft. The shaft and the adit portals are open. There are more than 3000 feet of drifts (Logan and Franke, 1936, p. 242). A considerable amount of stoping was done southeast of the shaft. There are also numerous open cuts and prospect holes in the vicinity. Except for several buildings, there is no equipment on the property.

Gold Knoll mine

Location: N½ sec. 32, T. 2 N., R. 12 E., M.D.M., 2½ miles northwest of Copperopolis. Ownership: Louis Cereghino et al., c/o Fred Seitz, 1540 Carol Avenue, Burlingame, California.

This gold mine was developed originally in 1925-27 by the Gold Knoll Mining Company (Logan and Franke, 1936, p. 260). During the 1930s it was operated by several concerns and individuals, including the Felix Mining Company, Alfred Meyers of San Francisco, and J. Bettencourt and J. H. Bowie of Copperopolis. In 1942 and 1943 some work was done in the mine by R. A. Ford of Copperopolis, and in 1953 a small amount of gold was recovered from a mill cleanup by Mr. Ford and Joseph Paltor of Copperopolis.

There are two quartz veins on the property, approximately 200 feet apart, which are known as the main or west vein and the east or Miller vein. They strike northwestward, dip 45° NE., and range from a few feet to as much as 26 feet in thickness. The ore is mostly low grade, usually averaging a few dollars per ton, but the sulfide concentrate from the west vein was reported to have been valued as high as $68.00 per ton (Logan and Franke, 1936, p. 260). Country rock in the vicinity of the veins is Mariposa slate with some green schist. Serpentine lies to the east.

The mine is developed by a 300-foot inclined shaft sunk on the west vein with levels at 50, 115, and 300 feet, and a crosscut adit which connects with the 50-foot level. The adit portal is 200 feet west of the shaft. Most of the workings are northwest of the shaft. There is a 1000-foot drift on the 300-foot level from which three crosscuts have been driven to the east vein. The ore was treated in a 10-stamp mill which remains on the property. It is equipped with amalgamation plates, two tables, and two vanners.

Gwin (Paloma) mine

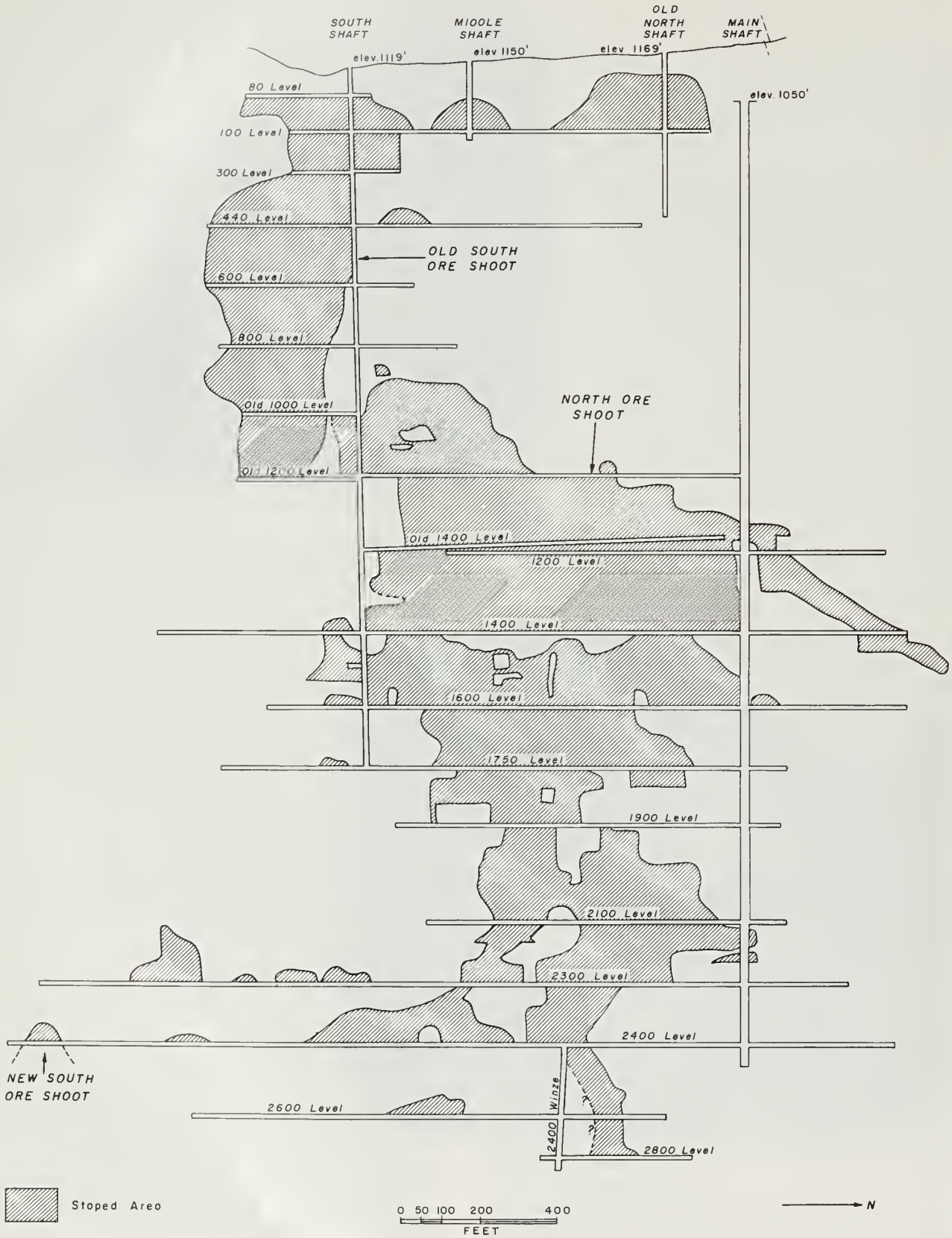
Location: Secs. 21, 22, 27 and 28, T. 5 N., R. 11 E., M.D.M., in Rich Gulch 4 miles southwest of Mokelumne Hill and just north of the old town of Paloma. Ownership: Gwin Mine Development Company, c/o J. A. Levensaler, 519 California Street, San Francisco, California.

The Gwin mine was one of the most productive Mother Lode gold mines in Calaveras County. The value of its total output is unknown, but information obtained from old reports shows that it is somewhere between 6 and 7 million dollars, at the old price of gold. Except for small amounts of surface exploration and development work done in the 1920s and 1940s, the mine has been left idle since 1908.

One of the first gold-quartz mines to have been opened in California, the Gwin (initially known as the Paloma) was originally prospected in 1850 (Mining and Scientific Press, 4/23/98, p. 437). Soon afterward a 200-foot shaft was sunk, and some high-grade ore was encoun-

Phata 16. Phata af the Gwin gald mine taken abaut 1900, shawing headframe, haisting plant, and 100-stamp mill building. Camera facing narthwest.

Phata 17. Another view af the Gwin gald mine taken abaut 1900, shawing the surface plant and mill building. Camera facing nartheast.



Modified from map accompanying private report by L.A. Levensoler and O.D. Rohlfs, 1940.

Figure 8. Longitudinal section of the Gwin gold mine.

tered. Senator William Gwin purchased the property in 1867 and later obtained the adjoining Alexander and Smith claims, which were consolidated as the Gwin mine. In the early 1870s this was the most productive gold mine in the county, and one of the most productive in the State, the yield being as much as $1,000 per day (Mining and Scientific Press, 5/23/74, p. 326). By 1877, the mine had been developed to an inclined depth of 1200 feet. In that year the so-called "main chimney" or North ore shoot was encountered, which yielded large quantities of ore between the 1200- and 1500-foot levels. The ore was treated in several stamp mills including one with 60 stamps and a chlorination works. The mine was shut down in 1882. The estimated value of the total output up to that date ranged from $2,000,000 (Irelan, 1887, p. 32) to $3,000,000 (Mining and Scientific Press, 9/14/95, p. 168).

In 1894 the newly organized Gwin Mine Development Company purchased the property and reopened the mine. The new vertical main shaft was sunk north of the old workings, and a new 40-stamp mill (that later was increased to 100 stamps) was erected. The mine was operated on a major scale until 1908. During this last operation, 984,442 tons of ore were mined and milled, which yielded approximately $4,044,000 (Levensaler and Rohlfs, 1940).

Apparently some work was done on the property in 1927 as the Mineral Resources of the United States for that year reported a yield of 100 ounces of gold (Min. Res. of U.S., 1927, part I, p. 273). In 1941 the surface was prospected by Robert Gallagher of Valley Springs and in 1946 by John Folsom of Valley Springs.

The Gwin vein is in the same belt of Mariposa slate that contains the highly productive Mother Lode mines to the north in Amador County. This belt is approximately 2000 feet wide in the Gwin mine area. The following information on the geology of the deposit is extracted from the U. S. Geological Survey Mother Lode folio (Ransome, 1900, p. 8): "South of the Mokelumne River, the Gwin mine is situated in a belt of Mariposa slates which is directly continuous with the slates of the Kennedy and Argonaut mines. The Gwin vein strikes with the slates and is generally parallel with their cleavage. It is accompanied by stringers, and varies in width, but on the whole is entitled to be called a simple vein rather than a stringer lead. The vein minerals are quartz, pyrite, arsenopyrite, free gold, and a little chalcopyrite, galena, zinc blende, albite, sericite, and calcite. Galena and zinc blende, when present in small amount, are considered to indicate good ore. The arsenopyrite is in both large and small crystals. The former are particularly prized, as they inclose beautiful arborescent masses of crystallized gold. All the free gold in the ore is coarse, and is easily caught on the plates after passing a No. 16 screen on the mortars; the tailings are said to average only 12 cents per ton. If true, this indicates a saving of about 98 percent of the gold, which is a remarkably high average. Common pyrite is by far the most abundant sulphide in the ore. The average value of the ore is said to run from $5 to $7 per ton. The slates near the vein are impregnated with sulphurets, but these sulphurets are not so rich as those in the vein and are said to contain a larger proportion of silver. A conglomerate similar to many such beds occurring in the Mariposa formation lies on the foot-wall side of the vein, and is said to carry gold up to 50 cents per ton, as shown by several assays. The ore shoot in the Gwin appears to be pyramidal in form and to be nearly vertical as far as exploited."

There are two veins, the East or main vein from which most of the gold was obtained, and a west vein. The main vein strikes N. 12° W. and dips 60°–75° NE. The two principal ore shoots on the main vein were the Old South and North ore shoots (see fig. 8). The Old South shoot extended from the surface to the 1200-foot main shaft level and was mined by the Gwin Mining Company. Its stopes averaged 250 feet in length, and it had a maximum width of 22 feet. The North shoot was the principal source of production for the operation of the Gwin Mine Development Company. Stopes were hundreds of feet long and as much as 40 feet wide. However, considerable amounts of extremely low-grade rock were mined to supply sufficient feed for the 100-stamp mill (Levensaler and Rohlfs, 1940).

Toward the end of the last operations, an exploratory drift was driven south on the 2400-foot level which encountered a new ore body about 1700 feet south of the crosscut from the main shaft. This was known as the New South ore shoot. It had a length of about 95 feet and was reported to have contained from 0.79 to 1.3 ounces of gold per ton.

The mine is developed by the 2533-foot vertical main shaft, the 1800-foot inclined south shaft, and several old shallow shafts (see fig. 8). There are more than 25,000 feet of underground workings. The 100-stamp mill used in the last operation was driven by water power and was equipped with Frue vanners (Tucker, 1916, p. 85). No equipment remains on the property.

Ilex (Anglo-Saxon, Tiger) mine

Location: SE¼ sec. 35, T. 6 N., R. 12 E., M.D.M., 6 miles northeast of Mokelumne Hill in the old Rich Gulch district. Ownership: W. W. Steele and Julius Podesta, Jackson, California.

This gold mine is a consolidation of the Anglo-Saxon and Tiger mines which were originally worked separately. Both were mined extensively in the 1850s and 1860s. In 1868, the Anglo-Saxon was reported to be developed by three shafts and was yielding gold ore worth $40 per ton, and the Tiger had a 100-foot ore shoot that contained $20 ore (Mining and Scientific Press, 3/28/68, p. 178). The Tiger continued to be worked during the 1870s and 1880s and the ore was treated in a 10-stamp mill. C. H. Livingston was the operator. Sometime between 1886 and 1888, the Ilex Gold Mining Company was organized and consolidated the properties. An extensive surface plant was constructed that included a headframe 100 feet high, tramway, 40-stamp mill with Frue vanners, and a chlorination plant (Irelan, 1888, p. 135).

The mine was closed down shortly afterward and lay idle for many years. From 1935 to 1943 and again from 1945 to 1948, the surface was prospected by Malcom Longhead, and some production was recorded. The property apparently has been idle since 1948.

The deposit consists of a series of at least seven parallel quartz veins that have strikes of N. 70°-85° E. and dip steeply to the south. The ore contained varying amounts of sulfides including pyrite, galena, and smaller amounts of chalcopyrite, galena, and stibnite. The main or Ilex vein, which is in the center of the vein system, was reported to have contained an ore shoot 240 feet long (Irelan, 1888, p. 137). Country rock is coarse muscovite-biotite schist and impure quartzite. Granodiorite gneiss lies to the north. Diorite dikes are associated with the veins. The mine is developed by a 270-foot shaft both inclined and vertical, which is caved. A 1000-foot drift adit explores the Ilex vein and several shorter drifts explore the other veins. Numerous open cuts expose the surface of the deposit.

Kate Hageman (Comet, Gospel) mine

Location: Secs. 6 and 7, T. 4 N., R. 12 E., 2 miles northwest of San Andreas and just west of State Highway 49. Ownership: Dalaray Mines, Inc., et al., c/o John Munoz, Mokelumne Hill, California.

The Kate Hageman gold mine, which was originally known as the Comet mine, was active during the 1870s and 1880s when large amounts of ore were mined in an open cut and treated in a 20-stamp mill (Crawford, 1896, p. 101). In 1935, the mine was reopened by a partnership, consisting of R. Hageman, A. Garwood, and D. C. Smith of San Andreas (Logan and Franke, 1936, p. 267), which later was known as Dalaray Mines, Inc. A mill was erected, and considerable amounts of ore were mined in an open cut by power shovel. This operation continued until 1941, but the mine has been idle since.

This mine is on the Mother Lode gold belt. The quartz vein, which is as much as 9 feet thick, has a northwest strike and dips 51° NE. The footwall is greenstone, and the hanging wall is slate. Ore mined from the main quartz vein yielded $7 per ton, and quartz stringers west of the vein yielded $3 to $4 per ton in gold (Logan and Franke, 1936, p. 267). Besides the open cut, the mine is developed by a 25-foot shaft sunk on the vein and two old 300-foot crosscut adits driven from the east. The mill used in the last operation contained 10-stamp and three-stamp units.

Keltz mine

Location: S½ sec. 24, T. 7 N., R. 13 E., M.D.M., at Skull Flat 3½ miles northeast of West Point. Ownership: Julia B. Higgins, Mount Kisco, New York.

The Keltz mine was one of the chief sources of gold in the old Skull Flat mining district. It consists of several claims including the Keltz, Keltz Extension, Owl, Hard Lead, and Englishman. The mine was first worked during the early days of the gold rush, and according to several local residents, more than $300,000 was recovered from less than 200 tons of ore. The mine was active again during the 1880s and 1890s (Crawford, 1894, p. 94). In 1921, the property was reopened by the North Star Mines Company of Grass Valley. A crosscut adit was driven, but little ore was mined. In 1940-41, the dump was worked by T. A. Zimmerman of Sacramento and F. W. Whitford of Pine Grove (U. S. Bureau of Mines records), but the mine has been idle since.

There is a series of parallel north-striking quartz veins, but most of the work has been on the Keltz vein. This vein strikes N. 5° W., dips 75° W., and ranges from 1½ to 4 feet in thickness. Ore shoots 50 and 100 feet in length were developed (Logan, 1923a, p. 21). Sulfides are abundant, especially pyrite and galena. Fine-grained diorite dikes are associated with the veins. The mine is developed by a 450-foot east-trending crosscut adit, the portal of which is 100 feet above the Mokelumne River; and several older overlying adits, drifts, and an 80-foot shaft on the ridge.

Lamphear mine

Location: Sec. 18, T. 5 N., R. 12 E., M.D.M., 1 mile due south of Mokelumne Hill on ridge southeast of Chili Gulch. Ownership: Roanoke Mining Company, c/o Frank A. West, 311 East Main Street, Stockton 5, California.

The Lamphear gold mine was first worked about 1866, and the ore was treated in arrastras (Mining and Scientific Press, 4/8/66, p. 210). Soon afterward a 10-stamp mill was erected, and the mine was almost continuously active from the 1870s until around 1900. In 1896, it was purchased by the Roanoke Mining Company which operated the nearby Sport Hill hydraulic and lode mine. The mine was reopened in 1922 and operated intermittently until 1930, chiefly by the Lamphear Mining Company. Some work was done again on the property in 1934-35 by Precious Metals, Inc., of Buffalo, New York (Logan and Franke, 1936, p. 267). Published production figures show the mine to have a total output valued at about $122,000.

The Lamphear vein strikes in a northeasterly direction, dips 45° SE., and swells and pinches. It has a slate hanging wall and amphibolite schist footwall. In 1930, the last year for which production figures were available, 400 tons of ore yielded $4,000 (Min. Res. of U. S., 1930, part I, p. 989). The sulfide concentrates, which amounted to 3½ percent of the ore and of which 1 percent was galena, averaged $65 per ton at the old price (Logan, 1925, p. 155).

The mine is developed by a 300-foot inclined footwall shaft steeper than the vein with levels at 115, 180, and 280 feet. The vein has been stoped both northeast and southwest of the shaft chiefly above the 180-foot level. In the last operations, the ore was treated in a 20-stamp mill. The shaft is caved, and all equipment has been removed.

Lightner mine

Location: NE¼ sec. 33, T. 3 N., R. 13 E., M.D.M., in Angels Camp. Ownership: B. F. Wellington Jr., 409 Park Way, Piedmont 11, California.

This Mother Lode gold mine is in Angels Camp between the Utica and Angels mines. It was originally worked prior to 1857 to a depth of about 70 feet (Mining and Scientific Press, 12/5/96, p. 466). The mine was idle until 1896 when it was reopened by the Lightner Gold Mining Company which had just been organized. The deposit was first mined at the surface, then on a large scale by underground methods. Except for 1910, the mine was continuously active until 1915 when it was shut down. From 1896 to 1915, approximately 500,000 tons of ore were mined which yielded more than $3,000,000 (B. F. Wellington Jr., personal communication, 1957). The mine was dewatered in 1920, but there was no production, and it has been idle since.

As in the other gold mines in the Angels Camp area, the deposit contained large tonnages of low-grade ore. The main vein zone, which was as much as 120 feet wide, has a northwest strike and a dip which ranges from steep northeast to vertical. Above the 600-foot level the ore consisted of mineralized amphibolite schist and slate with quartz and talc. Below that level there are three distinctive vein zones. A vein of talc crosses the main vein between the 500- and 600-foot levels. The mine is developed by a 1050-foot shaft. The mill was equipped with 60 stamps and 36 Frue vanners.

Lockwood mine (Mina Rica)

Location: NW¼ sec. 6, T. 6 N., R. 14 E., and NE¼ sec. 6, T. 6 N., R. 13 E., M.D.M., 3 miles east of West Point. Ownership: Lockwood Consolidated Gold Mining Company, 1834 Sutter Street, San Francisco, California.

The Lockwood gold mine was active prior to and during the 1860s. In 1866, it was reported to have been developed to a depth of 100 feet, and ore valued as high as $100 per ton was being mined (Mining and Scientific Press, 8/11/66, p. 86). During this period it was operated by the Mina Rica Mining Company. The mine was active much of the time through the 1870s, 1880s, and 1890s. In 1888, it was described in detail in the Eighth Report of the State Mineralogist (Irelan, 1888, pp. 138-141). By this time it had been developed to a depth of 250 feet, and the ore was treated in a five-stamp mill.

In 1914, a considerable amount of exploration work was being done on the property (Tucker, 1916, p. 91), but apparently it lay idle for some years following. The mine was intermittently active during the 1930s; in 1936 the operator was John Rogers of Mojave (Logan and Franke, 1936, p. 269). From 1947 to 1949 the mine was operated by the Atlas Mining Company of West Point, Harry Briggs, president. The underground workings in the vicinity of the Austrian shaft were partially rehabilitated, and some ore was mined. Some diamond drilling was done also. The mine has been idle since 1949.

There are two parallel veins, the main or Lockwood vein, and the Austrian vein which lies to the northeast. Both strike N. 23° W. and dip steeply to the southwest. The principal development work has been on the Lockwood vein, from which most of the output has been obtained. It ranges from 1 to 3 feet in thickness, and the quartz is white to dark gray in color. The ore shoots are associated with a number of shear zones that strike N. 13° W. (Tucker, 1916, p. 91). Two ore shoots with stope lengths of 100 and 150 feet were mined. The ore contains some free gold and abundant sulfides including pyrite, marcasite, pyrrhotite, galena, and sphalerite. Country rock is granodiorite. The vein is cut at right angles and diagonally by fine-grained diorite dikes.

The mine is developed by the 430-foot Lockwood shaft with levels at 68, 124, 176, 230, and 325 feet, and the 195-foot Austrian shaft which is approximately 500 feet to the southeast where most of the recent work was done. Several old shallower shafts also are on the property. An old mill is equipped with a jaw crusher, bucket elevator, Chilean mill with six rollers, and a Deister table.

Lone Star (Reed and Hillary) mine

Location: Sec. 5, T. 6 N., R. 13 E., M.D.M., 3 miles northwest of West Point by the Mokelumne River.

Photo 18. Headfrome and hoist house ot the Lockwood gold mine, 3 miles eost of West Point. Ore from this mine commonly is rich in sulfides.

Ownership: Paul J. Humphrey Estate, 841 Almond Street, Yuba City, California.

The Lone Star gold mine was originally worked in 1854 (Logan, 1923a, p. 20). During the 1860s, 1870s, and 1880s, it was highly productive. One 15-ton lot of ore mined in 1873 yielded $3000 (Mining and Scientific Press, 12/13/73, p. 372) and a 23-ton lot yielded $4000 in 1879 (Mining and Scientific Press, 11/8/79, p. 293). During these years the firm of Reed and Manley, and later Reed and Hillary, were the operators. The mine was patented in 1892 by I. H. Reed. Shortly afterward it was purchased by the Lone Star Mining Company of San Francisco. In 1894 it was the largest gold mine in operation in the West Point district (Crawford, 1894, p. 94). The ore was treated in a 20-stamp mill. The Farmington Gold Mining Company later operated the mine for a few years ending in 1905. From 1920 to 1922, the property was extensively prospected by the North Star Mines Company of Grass Valley, and in 1923 it was being worked on a small scale by J. B. Stapler and Company (Logan, 1924, p. 76). Except for small amounts of prospecting in the vicinity of the mine during the 1930s, it has been idle since.

The deposit consists of several parallel quartz veins in granodiorite. The veins strike from north to N. 15° W. and dip 75° W. The two largest and most productive were the Lone Star, and the Reed and Hillary, which is approximately 90 feet west of the Lone Star. These are among the longest veins in the district. The average thickness of the veins is 2 to 4 feet, but in some areas they swell to as much as 17 feet. Considerable amounts of fault gouge are present. The ore contains free gold and a considerable number of sulfides, including pyrrhotite. Several ore shoots were mined, the stope lengths of which ranged from 100 to 320 feet laterally (Logan, 1923a, p. 21), and pitch 30° to the north. Both veins are developed by a number of south-trending drift adits, the portal of the lowest being a few feet above the river. The longest are the No. 4 and No. 5 adits, 2500 and 1500 feet long respectively, on the Lone Star vein. The Reed and Hillary vein also is developed by several south-trending drift adits.

Lookout Mountain mine

Location: SE¼ sec. 1 and NE¼ sec. 12, T. 4 N., R. 11 E., M.D.M., 3 miles northwest of San Andreas on the Judd Ranch. Ownership: Lookout Mountain Mining Company, 33 California Street, San Francisco, California.

This Mother Lode gold mine probably was first worked many years ago. From 1931 to 1938 it was worked intermittently by the owners. A mill was erected which treated ore from this mine, the Golden Hill mine half a mile to the north, and the Etna mine. It was prospected again in 1946 but has been idle since.

The deposit consists of a zone of quartz stringers and chloritic amphibolite schist as much as 60 feet thick containing disseminated free gold, auriferous pyrite, and small amounts of chalcopyrite. The ore is low in grade; $1 to $3 in gold per ton is the average value, but the reserves have been estimated to be large (Julihn and Horton, 1938, p. 127). Concentrates ranged from $60 to $90 per ton in value, The vein zone strikes N. 10°–20° W. and dips 80° NE. Serpentine and pyroxenite lie to the east and Mariposa slate to the west.

The mine is developed by a 50-foot adit driven southeastward, 2000 feet of drifts and crosscuts and a 100-foot winze with a level at 80 feet. The ore was treated in a plant equipped with a hammer mill, two Huntington mills, plates, and two Deister tables. The equipment has been removed, but several buildings remain on the property. The underground workings are accessible.

Madison (Lane and Tulloch, Matson) mine

Location: SE¼ sec. 33, T. 3 N., R. 13 E., M.D.M., just southwest of Angels Camp. Ownership: Utica Mines, Inc., 220 Montgomery Street, San Francisco, California.

This mine, which was originally known as the Lane and Tulloch, is on the Mother Lode just south of the Gold Cliff mine. It was worked on a small scale in the late 1870s and 1880s, and the ore was concentrated in arrastras (Mining and Scientific Press, 3/25/82, p. 188). Around 1887, the concern of Hobart and Hayward, which controlled the Utica mine and other properties in the area, purchased the mine. It was developed extensively and operated on a large scale during the 1890s. A 20-stamp mill was erected that later was increased to 40 stamps. The mine was shut down some time around 1900, and except for being dewatered in 1903, it has been idle since.

The ore body, which is as much as 40 feet wide, consists of gold-bearing chloritic amphibolite schist heavily impregnated with pyrite and cut by numerous quartz stringers. On the hanging wall lies a nearly barren quartz vein as much as 8 feet wide. The ore body strikes in a northwesterly direction and has an average dip of 43 degrees to the northeast. The mine is developed by a 1500-foot inclined shaft with levels at each 100 feet. There are thousands of feet of drifts, the longest of which connects with the Gold Cliff mine (Logan, 1935, p. 144) (see fig. 10). All of the workings are inaccessible, and there is no equipment on the property.

Mar John mine

Location: NW¼ sec. 21, T. 4 N., R. 14 E., M.D.M., by the Sheep Ranch-Murphys road on Indian Creek 2 miles southeast of Sheep Ranch. Ownership: Louis Domenghini and Lester Canevaro, Mountain Ranch, California.

The Mar John gold mine includes the Enchantress and Oro Minto claims, which were known as the Old Calaveras group, and the South Bank and Washington Pescia claims. The Enchantress and Oro Minto claims were operated during the 1870s and 1880s by the Calaveras Gold Mining Company, and the ore was treated in a 20-stamp mill. By 1884, these properties had yielded $300,000 (Mining and Scientific Press, 12/13/84, p. 376). Thereafter and until the early 1920s, only intermittent work was done on the property.

Photo 19. The Mar John gold mine. Camera facing east. *Photo by Mary Hill.*

In 1923, the mine was bonded to the Mar-John Company (Min. Res. of U. S., part I, Metals, 1923, p. 347), but active mining was not done until 1928 (Logan and Franke, 1936, p. 271). A new mill was erected, and the mine rehabilitated, and worked almost continuously until 1936. Some work was done in 1938 by W. F. Hoppe of Angels Camp, but the mine has been idle since. The estimated total output of the mine is valued at approximately $360,000 (Louis Domenghini, personal communication, 1957). Beginning about 1925 and continuing intermittently until 1930, prospecting for cobalt was done on the northeast end of the property. Although several tons of cobalt-bearing ore were mined, apparently none was marketed (Logan and Franke, 1936, p. 273).

Native gold, pyrite, galena, and minor amounts of sphalerite are found in five northeast-trending quartz veins that range from 2 to 4 feet in thickness. The principal vein is the Calaveras vein, which strikes N. 70° E. and dips to the southeast. Country rock is mica schist, slate, and quartzite of the Calaveras formation. The dump also contains small amounts of diorite and gabbro. At the cobalt prospect, small amounts of smaltite and erythrite with arsenopyrite were found in a stringer a few inches wide in mica schist and quartzite.

The property is developed by the 450-foot Calaveras or Mar John shaft with levels at 120, 240, 350, and 450 feet and a 350-foot shaft 400 feet to the southeast. Most of the stoping was done between these two shafts. Crosscuts have been driven northwest and southeast from the 350-foot level. The southeast-trending crosscut extends to the Enchantress vein where some drifting was done. The cobalt prospect was developed by a 175-foot shaft.

Ore was treated in a 10-stamp mill with a flotation unit, portions of which remain on the property. During 1935 about 14 tons of ore were milled daily (Logan and Franke, 1936, p. 273). Concentrates were sent to the Amador Metals Reduction Company in Jackson.

Marquis mine

Location: Sec. 12, T. 6 N., R. 13 E., M.D.M., 2 miles southeast of West Point. Ownership: James M. Marquis, West Point, California; leased to Dave Egenhoff and Robert Allen, of West Point.

The Marquis gold mine was opened in 1945 by Mr. Marquis and has been intermittently worked since. Free gold associated with pyrite and galena are in a quartz vein that ranges from a few inches to 16 inches in width. The vein strikes in a northerly direction and dips to the west. Country rock is quartz-diorite and granodiorite. A left lateral fault with a west strike and vertical dip has displaced the vein by 4 feet. The principal ore shoot is at the intersection of the south segment of the vein and the fault. In place the ore shoot is about 6 feet in diameter. It was mined to a height of about 35 feet above the 80-foot level. The ore shoot is believed to persist in depth (James Marquis, personal communication, 1954) but has not been explored. Two smaller quartz veins were encountered at the bottom of the shaft which appear to intersect the faulted north segment of the main vein.

Development work includes an 85-foot, west-inclined shaft with a level at 80 feet. On the 80-foot level, an 18-foot south lateral was driven along the fault zone.

The north segment of the faulted vein was encountered in the crosscut 16 feet from the south lateral. At a distance of 20 feet in the crosscut, the south segment of the vein was encountered and a drift was driven 20 feet south along the vein. A 35-foot raise, which holed an old 55-foot shaft that had been sunk during 1945-46, was driven from the drift south. Some stoping has been done off of the raise. Three men work at the mine.

Mother Lode Central mine

Location: SE¼ sec. 3 and NE¼ sec. 10, T. 2 N., R. 13 E., M.D.M., 1 mile southeast of Angels Camp and just west of State Highway 49. Ownership: Aileen A. Morgans et al., and Tillie Rolleri et al., c/o Romie Rolleri, Angels Camp, California.

This gold mine consists of the Bullion and Marble Springs claims, both of which were originally worked separately. The Bullion claim was mined prior to and during the early 1900s (Logan and Franke, 1935, p. 276). Mother Lode Central Mines, Inc. was organized in 1934 and consolidated the claims. A shaft was sunk on the Marble Springs claim, and a considerable amount of development work was done. Operations ceased in 1939, and the mine has been idle since. Occasionally the dump is used as a source of fill material.

There are two veins on the property, the Marble Springs vein which strikes northwestward and dips 55° NE., and the Bullion vein to the southwest which strikes nearly westward and dips 55° N. The Marble Springs vein is as much as 15 feet thick. An ore shoot was developed on this vein several hundred feet southeast of the shaft, which had a stope length of 130 feet and a pitch length of at least 300 feet. It was reported to have contained ore averaging $7.50 per ton in gold (Julihn and Horton, 1938, p. 117). Country rock is green schist.

The mine is developed by at least three shafts: No. 1 shaft on the Marble Spring claim, which has an inclined depth of 200 feet and from which a 105-foot crosscut extends to the vein on the 200-foot level; No. 2 shaft some 500 feet to the southeast and sunk on the vein, which has an inclined depth of about 600 feet; and an old 150-foot inclined shaft on the Bullion vein. A 500-foot drift connects No. 1 and No. 2 shafts on the 200-foot level. Other than several buildings, no equipment remains on the property.

Mountain King mine

Location: SW¼ sec. 19 and NW¼ sec. 30, T. 2 N., R. 12 E., M.D.M., adjoining the Royal mine on the northwest in the Hodson district, 4 miles northwest of Copperopolis. Ownership: C. W. Stewart and C. E. Nuss, P. O. Box 886, Fresno, California.

The Mountain King gold mine consists of 13 claims which include the Bulger Consolidated, Last Chance, and Mountain King. The property was active in the 1890s (Crawford, 1896, p. 114), and by 1904 it had been developed to an inclined depth of 500 feet. After an idleness of some years, the mine was reopened in 1930 by Byron Rowe (Logan and Franke, 1936, p. 277). At that time the ore was treated in an old 10-stamp mill. In 1936, the Jumbo Consolidated Mining Company was organized by Mr. Rowe, and this concern operated the property on a major scale until 1941. The shaft was extended to an inclined depth of 1200 feet, and a large new mill was erected. In 1941 and 1942, El Gabilan Corporation of Copperopolis worked the mine. During World War II, large amounts of copper ore from the Keystone-Union mines at Copperopolis were concentrated at the mill. A partnership known as the Mountain King Mill and Mine Company reopened the mine in 1945 and worked it by open-pit methods until 1948. For a few months in 1953, asbestos ore from the Jamestown area, Tuolumne County was treated in the mill. In 1955 and 1956, the New Jersey Zinc Company leased this mine and the adjoining Royal mine for exploration purposes. This concern sank eight vertical diamond-drill holes as much as 1000 feet in depth in the hanging-wall portion of the deposit. Since then the property has been idle.

The value of the total output of the mine is unknown, but it is well over 1 million dollars. In 1940, the property was estimated to have yielded about 300,000 tons of ore that ranged from $3 to $8 per ton in value (F. R. Wicks, private report, 1940).

This deposit is the north portion of the mineralized area along the Hodson fault zone that extends northwest from the Royal mine. The total mineralized area is estimated to be at least 4000 feet long and as much as 500 feet wide (Harry Bush, personal communication, 1958). The main Mountain King vein system consisting of quartz veins and stringers strikes N. 32° W. and dips 30° NE. It ranges from 5 to 50 feet in thickness. Amphibolite schist and greenstone form the hanging wall and Mariposa slate the footwall. Numerous quartz stringers cut the hanging wall, and shoots of "gray ore" consisting of mineralized amphibolite and greenstone are near the intersection of these stringers and the main vein. Ore mined during the 1930s had an average value of $5 to $6 per ton (Julihn and Horton, 1938, p. 119). The concentrates had an average value of about $150 per ton (Wicks, F. R., 1940). Another quartz vein lying to the northeast, known as the Pine Log vein, intersects the Mountain King between the 800- and 1000-foot levels.

The mine is developed by the 26-degree-inclined 1300-foot Mountain King shaft. Levels at 150, 200, 300, 400, 600, 800, 1000, and 1200 feet total more than 5000 feet of underground workings. The principal development work has been done on the 800-, 1000-, and 1200-foot levels. On the 200-foot level, a 120-foot crosscut extends northeast to the Pine Log vein where an inclined raise was run to the surface. About 100 feet northwest from the Mountain King shaft is the 110-foot Bulger shaft. The Mountain King shaft is open.

The open pit, which was mined during the period of 1945-48, is 800 feet southeast of the Mountain King shaft. The pit is 300 feet long, 120 feet wide, and as much as 75 feet deep. About 1700 feet east of the shaft are several open cuts. The mill, which remains on the property, contains ore bins, a jaw crusher, a gyratory crusher, two 6-

Photo 20. Mountoin King gold mine ond mill, Hodson district. During World Wor II, copper ore from Copperopolis wos treoted ot the mill.

by 8-foot and one 5- by 5-foot ball mills, three rake classifiers, a conditioner tank, 24 Knudsen bowls, 12 flotation cells, two thickeners, and two Eimco filters. The rated capacity of the mill was 250 tons per day. Besides the buildings containing the mill and hoist, there are several other buildings on the property.

North Star mine

Location: S½ sec. 33, T. 3 N., R. 13 E., M.D.M., a quarter of a mile west of Angels Camp. Ownership: Utica Mines, Inc., 220 Montgomery Street, San Francisco, California.

This mine is in the west portion of the Mother Lode gold belt west of Angels Camp. Little is known of its early history, but it probably was worked originally during the early days of the gold rush when rich surface ores were mined in quantity in the area. The mine was active again during the 1880s (Mining and Scientific Press, 3/26/87, p. 208). It was reopened in 1909 by the Dolling Gold Mining Company which sank a new shaft and erected a mill. Operations continued until 1913, but the output for this period was valued at less than $90,000 (Logan, 1935, p. 145). The value of the total production is unknown, but it is estimated to be far in excess of $100,000.

The vein is a branch of the Madison-Gold Cliff vein system (see fig. 10). It has a west-northwest strike, dips approximately 60° N., and averages 15 feet in thickness. Country rock is greenstone and amphibolite schist. Most of the gold recovered from the ore mined during the last period of operation was contained in the sulfides which constituted 1½ to 2 percent of the ore. The sulfide concentrates contained an average of $50 per ton in gold at the old price (Logan, 1935, p. 145). The mine is developed by a 480-foot inclined shaft with levels at each 100 feet. In the last operations the ore was treated in a 40-stamp mill. The workings are inaccessible, and all equipment has been removed from the property.

Oro y Plata (Red Wing-Willard) mine

Location: NE¼ sec. 6, T. 3 N., R. 14 E., M.D.M., 1 mile north of Murphys. Ownership: Mary Bess Norton, c/o J. C. Scoles, Murphys, California; leased by Lee Cox, Murphys.

The Oro y Plata gold mine, which also has been known as the Red Wing and Willard mine, was active during the 1860s when the ore was treated in a five-stamp mill (Mining and Scientific Press, 4/13/67, p. 230). It was extensively worked from about 1878 to 1888 by the Willard Mining Company. The ore was treated by the chlorination process (Morse, 1887, pp. 35-42). Thereafter, the mine was idle most of the time until 1926 when it was acquired by the present owner. It was operated by the owner from 1926 to 1931. Later it was leased by several concerns including the Orion Mining Company of San Francisco, which treated accumulated tailings in a cyanidation plant in 1936-38. The owner again worked the property in 1941 and 1942. The mine was last worked by California Gold Mines, Inc., in 1947. At present Lee Cox of Murphys is developing a small adit which is used as a tourist attraction.

Complete descriptions of the geology, veins, mine workings, and mill are in the Thirty-Second Report of the State Mineralogist (Logan and Franke, 1936, pp. 278-281) and U. S. Bureau of Mines Bulletin 413 (Julihn and Horton, 1938, pp. 124-126). Six west-trending veins are on the property, in the contact zone between several northwest-trending diorite bodies in limestone. The veins dip steeply to the north or south. The veins in order from north to south are: Pay Rock No. 1, Pay Rock No. 2, Oro Plata, Red Wing, Blue Wing, and White Wing. The ore contains free gold with various amounts of sulfides including galena, stibnite, and tetrahedrite. Cinnabar was reported to have been found in the ore also (Turner and Ransome, 1898, p. 8).

The property is developed by open cuts, adits, a glory hole, and a number of shafts including the 286-foot vertical Oro Plata and the 317-foot vertical Blue Wing shafts. The 50-ton mill used in the last operations was equipped with a jaw crusher, ball mill, Harz jig, rake classifier, and four flotation cells.

Osborne mine

Location: SE¼ sec. 20, T. 3 N., R. 13 E., M.D.M., 1½ miles due west of Angels Camp and half a mile north of State Highway 4 via dirt road. Ownership: George W. Osborne et al., Ripon, California.

The Osborne gold mine, which is also known as the Belmont-Osborne mine, and in the past was known as

the Knox and Osborne or Osborne Consolidated, was purchased by Samuel Osborne in 1850. He and his two brothers operated the mine until 1880 (John R. Osborne, personal communication, 1957). The surface area was mined, and a depth of 180 feet was finally attained. The ore was treated in a 20-stamp mill (Mining and Scientific Press, 11/20/80, p. 324).

The mine lay idle until 1929 when it was reopened by the newly organized Belmont-Osborne Mining Company. A new shaft was sunk, a 20-stamp mill erected, and the mine was worked intermittently until 1935. The value of the output from this operation was between $13,000 and $15,000 (John R. Osborne, personal communication, 1957). In 1935, the California-Osborne Mining Company, which was controlled by the California-Engels Mining Company, leased the property. A 200-ton mill was erected and ore from neighboring mines was treated, but no ore was produced from the Osborne mine. This operation ceased shortly after 1936. At present dump material is intermittently used for road fill.

This property is in the west portion of the Mother Lode gold belt and lies within the same vein system that contains the Parnell and Benson mines to the northwest and the Gold Hill, Wagon Rut, and Evening Star mines to the southeast (see fig. 2). At least four parallel veins are on the property, in a zone 75 feet wide which strikes from N. 42° W. to N. 55° W. and dips approximately 75° NE. The veins range from 4 to 12 feet in thickness and consist of quartz with various amounts of calcite, pyrite, and schist. Some of the adjacent country rock contains disseminated pyrite. Ore mined during the middle 1930s averaged $10 to $14 per ton in gold (Logan and Franke, 1936, p. 242). The footwall of the ore zone is amphibolite schist, and the hanging wall is black slate and phyllite.

The mine is developed by a 350-foot inclined main shaft sunk on the westernmost vein with levels at 70, 150, and 350 feet; and two older shafts, one 330 feet to the north that is 101 feet deep, and the other, 164 feet deep, to the south. The main shaft is open. A 160-foot crosscut extends to the northeast on the 150-foot level and another 140 feet to the northeast on the 350-foot level. There have been several mills on the property including two with 20 stamps each. The 200-ton mill erected by the California-Osborne Mining Company was equipped with a crusher, ball mill, Dorr classifier, amalgamator, six flotation cells, thickener, and filter (Logan and Franke, 1936, p. 242). Except for two buildings, all equipment has been removed from the property.

Petticoat mine

Location: E½ sec. 26, T. 6 N., R. 13 E., M.D.M., half a mile east of Railroad Flat. Ownership: Thomas A. Taylor, Railroad Flat, California.

The Petticoat was one of the best-known gold mines of the Railroad Flat district. It was extensively worked from about 1860 to the early 1880s. In 1867, one 42-ton lot of ore was reported to have yielded more than $2500 (Mining and Scientific Press, 12/7/57, p. 358). Among the early operators were a Mr. Said and a Captain Merryman. By 1872, the shaft had reached an inclined depth of 450 feet, and the ore was being treated in a 10-stamp mill. The mine was idle for some years following the early 1880s. In 1896 it was reopened by Rosenfeld and Sons of San Francisco (Mining and Scientific Press, 11/4/96, p. 406), and was intermittently worked until about 1912. Apparently, the mine has been idle since. The value of the total output is not known, but it is estimated to be far in excess of $150,000 (Ruby Taylor, personal communication, 1957).

The vein, which ranges from 2 to 7 feet in thickness, strikes N. 15° W. and dips 65° NE. Country rock consists of graphitic slate and quartz-mica schist of the Calaveras formation. It is developed by a 680-foot main inclined shaft and a 210-foot shaft 1200 feet to the northeast. Both shafts are caved, and no equipment remains on the property.

Quaker City mine

Location: Sec. 26, T. 5 N., R. 11 E., M.D.M., 4 miles southwest of Mokelumne Hill, just south of State Highway 8 and above Chili Gulch. Ownership: Quaker City Gold Mining Company, c/o Mrs. James Spiers, 1366 High Street, Alameda, California.

The Quaker City gold mine was originally worked about 1868 (Irelan, 1888, p. 144) and was active until around 1876 (Mining and Scientific Press, 7/1/76, p. 5). It was reopened in 1886 and worked on a fairly large scale until at least 1892 and then kept dewatered through 1896 (Crawford, 1896, p. 114). Although there is no record of subsequent operations, it may have been prospected during the 1920s or 1930s. The value of its total output is not known, but extensive dumps indicate considerable work.

The mine is on the Mother Lode in the mile-wide belt of Mariposa slate that extends southeast from the Jackson area of Amador County. The vein, which ranges from 6 inches to 5 feet in thickness, strikes about N. 30° W. and dips about 60° NE. Adjacent to the vein in the hanging wall is a belt of gouge as much as 30 feet thick. The footwall is greenstone, which is present as a lens in the slate. A cross-section of the mine is shown in the Eighth Report of the State Mineralogist (Irelan, 1888, p. 145). The ore was free milling and contained about 1 percent pyrite. The mine is developed by a shaft that is at least 600 feet deep. The first 400 feet is vertical, and the remainder is inclined on the vein. A 640-foot north-trending adit is connected with the shaft at a depth of 103 feet (Logan, 1935, p. 146). The shaft is caved, and no equipment remains on the property.

Quartz Glen (Foote and Thompson) mine

Location: SW¼ sec. 26, and NW¼ sec. 35, T. 6 N., R. 12 E., M.D.M., just south of the Mokelumne River in Rich Gulch 6 miles northeast of Mokleumne Hill. Ownership: Percy S. Peek et al., Mokelumne Hill, California.

This gold mine was worked extensively prior to 1866 and by that year had been credited with an output of

$200,000 (Mining and Scientific Press, 4/7/66, p. 210). It was active much of the time during the 1870s and 1880s, and a considerable amount of high-grade surface ore was mined. In 1896, the mine was being operated on a major scale by the Roanoke Mining Company (Crawford, 1896, p. 116). It was worked intermittently until about 1913. In 1910, a $15,000 pocket was reported to have been found on the property (Mining and Scientific Press, 6/25/10, p. 943). It was prospected again during the 1930s and from 1940 to 1942, but little ore was mined (Percy Peek, personal communication, 1957). The value of the total output of the mine is unknown, but older reports show it greatly exceeds $300,000.

The vein, which averages 5 to 6 feet in thickness, has a north to northwest strike and dips to the east. It is in the contact zone between granodiorite on the west and slates and mica schist of the Calaveras formation on the east. The ore averaged $3 to $8 per ton at the old price of gold, but some lots contained as much as $27 per ton (Logan and Franke, 1936, p. 256). The mine is developed by three adits. The No. 1 adit, about 75 feet above the Mokelumne River, is a crosscut 324 feet to the vein. The upper No. 2 and No. 3 adits follow the vein for 1,563 feet and 1,100 feet respectively. The ore was treated in several stamp mills including one with 20 and another with 10 stamps.

Ranch (McCarty, New York-Calaveras, Sherman Ranch) mine

Location: S½ sec. 33, T. 3 N., R. 11 E., M.D.M., 5½ miles northeast of Milton. Ownership: Jackson D. McCarty Co., c/o Al McCarty, 1246 North Commerce Street, Stockton, California.

The Ranch gold mine was worked originally from 1903 to 1906 (U. S. Bureau of Mines records). Some work was done from 1928 to 1935 by lessees including E. H. Hartley & Associates (Logan and Franke, 1936, p. 282). In 1936 it was sampled by J. H. Bowie of Copperopolis (Julihn and Horton, 1938, p. 134). From 1940 to 1942 the mine was operated by J. T. McCarty and S. A. Hiscox of Copperopolis, but it has been idle since.

Native gold and auriferous pyrite are in a quartz vein that strikes northwestward and dips about 30° to the northeast. The vein ranges from 2 to 18 feet in thickness. Above the 100-foot level the ore is largely free-milling, but below the 100-foot level, the gold is chiefly in sulfides (Logan and Franke, 1936, p. 283). Samples cut across an average vein width of 8 feet in 1936 were valued at $4.20 in gold per ton (Julihn and Horton, 1938, p. 134). Country rock is Mariposa slate.

The mine is developed by two inclined shafts 400 feet apart. The north shaft is 200 feet deep and the south shaft 235 feet deep. They are connected on the 100-foot level. A 75-foot drift extends southeast from the south shaft on the 100-foot level. On the 300-foot level of the south shaft a drift extends 250 feet southeast. From 1940 to 1942 ore was treated in a 10-stamp mill just west of the south shaft.

About a quarter of a mile north of the north shaft a "blanket" vein dips about 10° W. This vein was mined by open pit methods between 1928 and 19[illegible] developed by a 200-foot inclined shaft.

Right Bower (Great Western, Western) mine

Location: W½ sec. 20, T. 4 N., R. 14 E., M.D.M., just north of Indian Creek and 2 miles due south of Sheep Ranch. Ownership: Alice Deleray, 2600 Union Street, San Francisco; leased by Henry Peterson, P. O. Box 53, Murphys, California.

The Right Bower gold mine was originally worked during the 1870s. At that time ore was treated in an eight-stamp mill (Mining and Scientific Press, 9/14/72, p. 164). It was active during the 1890s and again around 1905 when there was substantial production. During the 1930s the property was worked by several concerns including the Western Quartz Mining Company of San Jose. The mine was reopened by the present operator in 1954 and has been active since.

The deposits consist of a series of narrow, west-trending, intensely faulted and sheared quartz veins in mica schist, quartz-mica schist and graphitic slate. Dip is vertical or nearly so. A number of dikes of fine-grained diorite and quartz diorite are present. The ore contains free gold and appreciable amounts of pyrite, galena, and chalcopyrite. Usually the gold is associated with galena.

The mine is developed by a north crosscut adit. About 500 feet in from the portal are two branches, one to the northeast and one to the northwest. Some 300 feet farther in on the northwest branch is a 140-foot vertical winze. The operators at present are working a small, rich ore body at the bottom of the winze. A crosscut is being driven north from the bottom of the winze. Numerous older workings in the mine include a 250-foot shaft, that connects with the adit level; crosscuts, raises, and winzes. During the 1930s, the ore was treated in a 35-ton mill, the building of which remains on the property. At present the ore is hand-sorted and shipped to the Selby smelter. Two men, including Mr. Peterson, work at the mine.

Photo 21. Adit portal and surface plant of the Right Bower gold mine, 4 miles north of Murphys. Camera facing north.

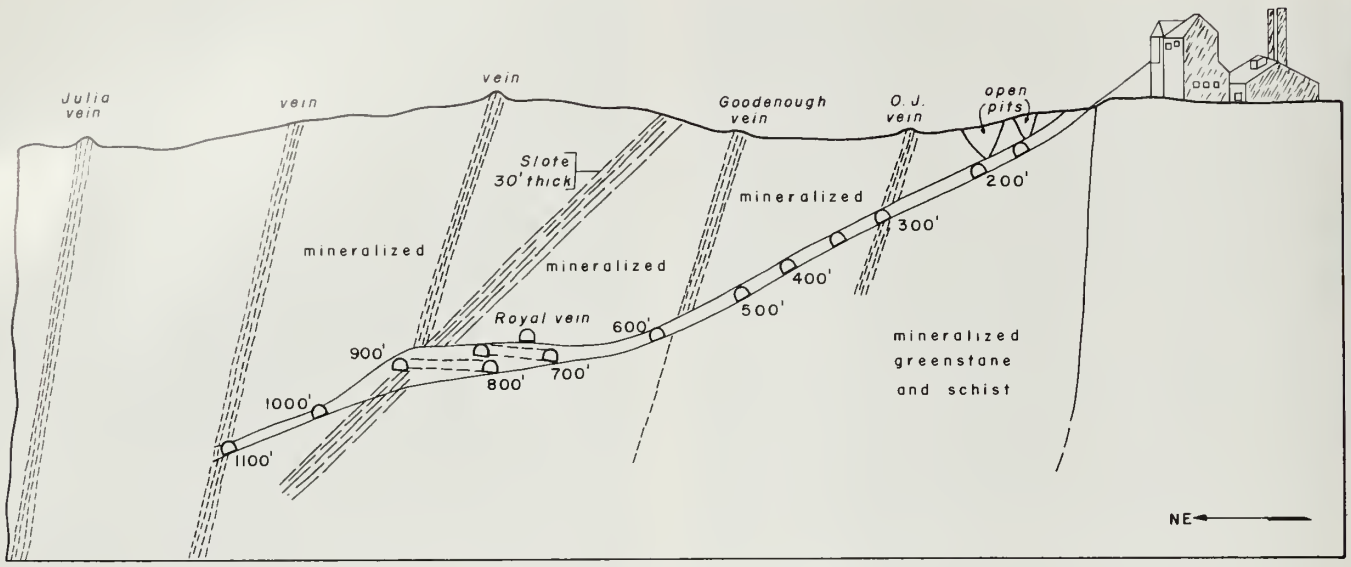


Figure 9. Cross section of Royal gold mine.

Royal mine

Location: NE¼ sec. 30, T. 2 N., R. 12 E., M.D.M., 3½ miles northwest of Copperopolis and just north of Hodson. Ownership: Effie M. Tower, Farmington, California.

The largest and most productive mine of the West Gold Belt in Calaveras County, the Royal mine consists of a number of claims including the Emma, Goodenough, Royal Lode, and Royal Mine Extension. The mine was originally worked prior to 1883. In 1884 it was being developed by the Pine Log Mining Company (Mining and Scientific Press, 12/27/84, p. 408). By 1892 it had been developed to an inclined depth of 185 feet, and the ore was being treated in a 10-stamp mill.

Soon afterward the Royal Consolidated Mining Company was organized, and beginning in 1895 under the direction of D. Jutton and later J. C. Kemp van Ee, the mine was developed and worked on a major scale. The mill was increased to 40 stamps, and in 1903 a new 120-stamp mill was completed. Operations continued until 1905. It was reopened in 1914 and operated intermittently until 1931 (Logan and Franke, 1936, p. 285).

From 1932 to 1942, it was operated on a moderate scale by F. S. Tower of Milton. Ten or twenty of the 120 stamps of the mill were used, and some custom milling was done. Also, surface ores were mined by means of shallow shafts by a number of lessees. Some mining and considerable surface prospecting was done by the Pacific Bridge Company of San Francisco in 1945-46. From 1947 to 1954, Joseph Paltor and several partners produced some gold largely from mill cleanups (U. S. Bureau of Mines Minerals Yearbooks). During this period some ore from the nearby Butcher Shop mine was treated at the mill. In 1955-56 the Royal and the Mountain King mines were leased by the New Jersey Zinc Company which sank several diamond drill holes (see also Mountain King mine in this chapter). These drill holes were as much as 1000 feet deep vertically and were sunk in the hanging wall portion of the deposit.

This mine and the adjoining Mountain King gold mine to the northwest are in the Hodson fault zone. This zone contains a series of parallel northwest-striking and northeast-dipping gold-quartz veins and adjacent bodies of mineralized greenstone and schist (see figure 9). These bodies of mineralized country rock are immense in size and are similar to the "gray ores" that were mined in Amador County (Knopf, 1929, p. 72). The mineralized zone is 500 or more feet thick and nearly 4000 feet long (Harry Bush, personal communication, 1958). There are at least five quartz veins which range from a few feet to as much as 20 feet in thickness. The gray ore has been formed by the hydrothermal alteration of greenstone into ankerite-sericite rock containing disseminated free gold and auriferous pyrite. About one half of the recovered gold was free gold; the remainder was from sulfides (Harry Bush, personal communication, 1958). Ore mined during 1895-1905, the greatest period of activity at the mine, yielded an average of $3.72 per ton (Tucker, 1916, p. 103).

The mine is developed by a 1200-foot inclined shaft with levels at 100-foot intervals. Most of the vein and gray ore between the 700- and 1000-foot levels had been stoped by 1905. In the latter 1930s, much of the output was from stopes between the 1000- and 1200-foot levels. A new 125-foot shaft, the Goodenough, was sunk 300 feet southeast of the Royal shaft. Room-and-pillar mining was the chief method employed.

From the mine the ore was sent through gyratory crushers at a separate crushing plant and then sent by an electric tramway to the 120-stamp mill. At the time of completion this was one of the largest gold mills in Cali-

Photo 22. Surface plant, crushers, and haisting plant at the Royal gold mine. Remains of the 120-stamp mill are at the extreme right. Camera facing sauth. *Phata by Mary Hill.*

fornia. The free gold was amalgamated, and sulfides were concentrated by flotation and vanning. The hoisting and crushing plant remain on the property, but the stamp mill has been largely dismantled. Both shafts are open.

Sanderson mine

Location: SW¼ sec. 35, T. 6 N., R. 13 E., M.D.M., 1 mile due south of Railroad Flat and just east of the Railroad Flat-Mountain Ranch road. Ownership: Amelia Stotts, R.F.D. Box 35, Mokelumne Hill, California.

The Sanderson gold mine originally was worked sometime prior to 1869. From that year until about 1875 it was worked extensively, and according to the present owner, the output was large. One 40-ton lot of ore mined in 1869 was reported to have yielded $2000 (Mining and Scientific Press, 10/30/69, p. 278), and another 36-ton lot yielded $1700 in 1872 (Mining and Scientific Press, 10/5/72, p. 212). In 1874, the mine had been developed to a depth of 400 feet. Apparently it lay idle for many years following 1875. In 1933 the mine was reopened by George Buyck and later operated by several lessees including R. D. M. Davis and Harold Wheaton of Los Angeles and the K. and K. Mining Company of Los Angeles. Operations ceased in 1938, and the mine has been idle since.

The quartz vein strikes north to northeast, dips 60° E., and ranges from 8 inches to 3 feet in thickness. The quartz ranges from white to dark gray in color. Sulfides are abundant, and the value of ore shipped in 1933 and 1934 ranged from $70 to $140 per ton (Logan and Franke, 1936, p. 287). Country rock is slate and quartz-mica schist of the Calaveras formation. The mine is developed by a 400-foot inclined shaft with levels at 100, 200, 300 and 360 feet. The shaft is open. Most of the production of the 1930s was from high-grade ore on the 360-foot level. Other than a wooden headframe, no equipment remains on the property.

Sheep Ranch (Wallace and Ferguson) mine

Location: SE¼ sec. 7, T. 4 N., R. 14 E., M.D.M., at the town of Sheep Ranch. Ownership: G. D. Martin, Sheep Ranch, California.

The Sheep Ranch mine, the most productive gold mine of the Sierran East Gold Belt, is believed to have been first worked in 1868. In that year a quartz vein was reported to have been discovered in the area by a Mr. Childers and son (Mining and Scientific Press, 6/16/77, p. 378). Apparently, however, the claims were located by Ferguson and Smith. By 1871 they had developed the property to a depth of 94 feet, and ore valued at $34 to $44 per ton was being recovered from a vein 8 to 20 inches thick; it was treated in arrastras (Mining and Scientific Press, 3/18/71, p. 163). Soon afterward the mine was sold to W. A. Wallace who erected a five-stamp mill. By early 1877, the mine had reached a depth of 200 feet and was credited with a total output valued at $300,000. James Ben Ali Haggin and Senator George Hearst gained control of the mine in that year (Mining and Scientific Press, 12/1/77, p. 341). A 20-stamp mill was erected, and the mine was worked on a major scale until 1893. By then it had been developed to a depth of 1400 feet, and its output was valued at $4,000,000 (Mining and Scientific Press, 9/14/95, p. 168). W. H. Clary reopened the mine in 1898, and it was active until 1907. After being shut down, accumulated tailings were treated in a cyanidation plant by the percolation method (Tucker, 1916, p. 105).

The mine was reopened in 1917 by the Golden Gate Exploration Company. The shaft was extended to a depth of 1700 feet, and about $360,000 was produced before it was shut down in 1922 (Logan and Franke, 1936, p. 288). Later the dump was worked.

In 1936 the mine was reopened by the St. Joseph Lead Company of New York. The workings were rehabilitated, a new 150-ton mill erected. The mine was operated continuously on a major scale until the spring of 1942. Except for minor amounts of gold that have been pro-

Photo 23. Dump of the Sheep Ranch gold mine. *Photo by Mary Hill.*

duced from the dump by F. L. Shevlin of Jackson in 1946 and by the present owner since 1951, the mine has been idle since 1942. The value of the total production of the mine is slightly more than $7,000,000 (G. D. Martin, personal communication, 1955).

The Sheep Ranch quartz vein strikes N. 55° W., dips 70°–75° NE., and ranges from 1 to 3 feet in thickness. The quartz ranges from white to bluish and blackish-gray in color; the presence of dark quartz is very characteristic of this mine. Country rock is dark quartz-mica schist of the Calaveras formation. Gabbro and diorite dikes commonly cut the schist and, in some places, the vein. Locally, graphitic schist is common. Native gold is in the vein with minor amounts of pyrite, chalcopyrite, galena, and sphalerite. Much of the gold is coarse, and a considerable amount of high-grade ore was recovered in the past. The main ore shoot which ranked about 45° SE., was mined for a distance of about 2600 feet.

The mine is developed by a 2100-foot inclined shaft and a winze sunk from the 2100-foot level to the 3100-foot level. The shaft is in the hanging wall about 70 feet from the vein. There are twenty-two levels, generally at 100-foot intervals. On the 300-foot level an adit extends 2500 feet southeast of the shaft and is known as the Pioche drain tunnel.

The following are production figures supplied by the owner for the mine from 1938 to 1942:

Year	*Tons of ore mined*	*Location*
1938	48,855	1,000 to 1,950 levels
1939	47,201	1,000 to 2,100 levels
1940	38,014	1,950 to 2,500 levels
1941	38,386	2,300 to 2,900 levels (some from 1,700 level)
1942	5,639 *	2,300 to 2,700 levels, mainly 2,500 level (some from 3,100 level also).

* Mining was stopped in April 1942.

The ore was treated in a 150-ton mill which included a primary gyratory crusher, secondary 6- x 6-foot ball mill, Bendelari and Pan-American Jigs, flotation cells, and filter press. Millheads averaged about $12 per ton. All equipment has been removed from the property.

Thorpe mine

Location: SW¼ sec. 11, T. 3 N., R. 12 E., M.D.M., just west of State Highway 49, 1 mile southeast of Fourth Crossing and 7 miles northwest of Angels Camp. Ownership: N. L. and G. L. Ponte, San Andreas, California.

The Thorpe gold mine was active during the 1860s. In 1871, the mine was developed by a 65-foot shaft, and ore yielding $6 per ton was treated in a five-stamp mill (Mining and Scientific Press, 3/18/71, p. 36). Operations continued fairly steadily until sometime around 1880. In 1891, some work was done on the property by the Utica Mining Company. In 1894, the mine was obtained by the Thorpe Mining Company which extended the shaft to a depth of more than 600 feet. The mine was purchased by the California Exploration Company in 1898. This concern erected a 30-stamp mill, but quit working the following year. Some work was done on the property again during the period of 1915 and 1916.

From 1927 to 1930, the Kirby Development Company rehabilitated the shaft, and did some prospecting and development work. However, only small amounts of ore were mined. The value of the total output of the mine is unknown.

The deposit consists of a zone of parallel quartz veins and stringers in amphibolite and chlorite schist. The veins contain pyrite, calcite, and some ankerite. Small amounts of talc and sericite schist are adjacent to the quartz. Phyllite and slate lie just to the west. It was reported that the ore was mostly where the margins of the main fissures were cut by zones of oblique minor fissuring (Logan,

1935, p. 143). The vein zone strikes northwestward, dips to the northeast, and in places is as much as 50 feet thick.

The main shaft, which is flooded, is about 700 feet deep on the incline, with levels at each 100 feet. Considerable stoping was done on the 300-, 400-, and 500-foot levels. Only one building remains on the property, all other equipment having been removed. The 30-stamp mill was equipped with Union concentrators.

Triple Lode (Blair, El Dorado) mine

Location: S½ sec. 32, T. 3 N., R. 13 E., M.D.M., 1 mile due west of Angels Camp. Ownership: J. B. Demaria and Margaret Gianera, 214 Columbus Avenue, San Francisco, California.

This gold mine is a consolidation of the Blair and El Dorado claims. It is located on the same Mother Lode vein system just west of Angels Camp that contains the Wagon Rut, Gold Hill, and Parnell mines to the northwest (see fig. 12). The property was worked by ground sluicing in the 1880s (Logan, 1935, p. 148), and beginning in 1892 it was worked by underground methods on a major scale. Operations continued until around 1898 when the mine had reached a depth of 450 feet. After lying idle for some years, the mine was reopened in 1920 by the Triple Lode Gold Mines, Inc. which sank a new 560-foot shaft northwest of the old one. Operations ceased in 1924, and except for the recent removal of dump material for road work, the mine has been idle since.

The vein ranges from 12 to 20 feet in thickness and consists of quartz and mineralized amphibolite schist containing abundant fine to coarse pyrite and small amounts of arsenopyrite. Appreciable amounts of calcite and ankerite are present. The vein strikes N. 45° W. and dips 55° NE. Several veins lie to the northeast, including one known as the East vein 300 feet northeast of the main vein. The mine is developed by two shafts, the old 450-foot main shaft, now caved, with levels at 150, 200, and 400 feet; and the new 560-foot shaft 200 feet to the northwest, which is open, with levels at 150, 250, and 500 feet. There are several thousand feet of drifts and crosscuts including several that extend to the East vein. The ore was treated in a 10-stamp mill that has been removed from the property.

Tulloch mine

Location: SW¼ sec. 11 and NW¼ sec. 14, T. 2 N., R. 13 E., M.D.M., on the Mother Lode 2 miles southeast of Angels Camp. Ownership: Utica Mines, Inc., et al., 220 Montgomery Street, San Francisco.

The Tulloch gold mine was worked originally prior to 1890. From 1893 to around 1900 a considerable amount of development work was done on the property. A 10-stamp mill was erected, and in 1900 the shaft was 250 feet deep (Storms, 1900, p. 121). The mine was active from 1909 to 1917, when the Tulloch Mining Company extended the shaft to a depth of 800 feet. Some work was done on the property again from about 1922 to 1929 (Logan, 1935, p. 149). In 1935 and 1936, some production was made by C. C. McCarty of Copperopolis and the Utica Mining Company (U. S. Bureau of Mines records), but the mine has been idle since.

The vein, which is several feet thick, strikes N. 45°-50° W., and dips 45° NE. The hanging wall is fine-grained chlorite-sericite schist and the footwall is slate and phyllite. Sulfides are abundant, and the ore was reported to have contained more galena than is usual for the Mother Lode (Tucker, 1915, p. 110). There were some high-grade pockets. The 800-foot inclined shaft is open, but all equipment has been removed from the property.

Union-Rathgeb (Cordova) mines

Location: Secs. 33 and 34, T. 4 N., R. 12 E., M.D.M., 3 miles southeast of San Andreas and just west of State Highway 49. Ownership: John Guttinger, San Andreas, California.

These two gold mines are on the Mother Lode gold belt approximately 3 miles southeast of San Andreas. Because of various consolidations and the fact that some of the older descriptions of the Rathgeb mine are actually of the Union mine (Logan and Franke, 1936, p. 283), they are described under one heading. The Union mine also has been known as the Union-Cordova mine.

The Rathgeb mine, which is about half a mile northeast of the Union mine, was active from the early 1850s until the 1870s. During these years the ore was treated in a 10-stamp mill. The Union mine was first worked by the Rathgeb brothers in the late 1860s (Logan and Franke, 1926, p. 292). Later it was sold to the Union Gold Company, Ltd., which erected a 30-stamp mill. Both mines were operated by this concern during the 1880s and early 1890s. In 1887 a rich gold pocket was discovered on the 120-foot level south of the shaft in the Union mine, which yielded more than $23,000. In the quartz and associated with the gold were black acicular crystals of uraninite with yellow uranium oxide (Logan, 1935, p. 147).

Photo 24. Union gold mine on the Mother Lode belt 3 miles southeast of San Andreas. A rich pocket of gold ore containing uranium was found in this mine in 1887.

Both mines were idle for many years following the 1890s. In 1933 the Union mine was partially rehabilitated by California Mother Lode Gold Mines, Inc., but there was no recorded production (Logan and Franke, 1936, p. 292). In 1954, the Uravan Uranium and Oil Company of Salt Lake City, Utah, leased both properties to explore for uranium. The Union shaft was cleaned out to a depth of about 150 feet. No uranium was found, but minor amounts of gold were produced. This work ceased in 1956, and the mines have been idle since. The value of the total output of the properties is unknown. It has been reported that the Rathgebs recovered $175,000 from above the 120-foot level of the Union mine (Knopf, 1929, p. 71).

The Union quartz vein has a strike of N. 30° W. and dips 70° NE. It contains appreciable fine-grained pyrite both in the quartz and in the adjacent wall rock which is amphibolite schist. The mine is developed by a 455-foot inclined shaft with levels at 120, 160, 220, 350, and 430 feet. There are three other shallow shafts. The main shaft is open to a depth of 150 feet. A steel headframe and hoist remain on the property.

The main Rathgeb vein half a mile to the northeast strikes nearly due north and dips 70° E. It ranges from 1 foot to 6 feet in thickness. The hanging wall is slate, and the footwall is amphibolite schist. It is developed by an open 220-foot shaft with levels at 120 and 200 feet.

Utica mine

Location: Secs. 33 and 34, T. 3 N., R. 13 E., M.D.M., in Angels Camp. Ownership: Utica Mines, Inc., 220 Montgomery Street, San Francisco, California.

One of the best-known gold producers of the Mother Lode belt, the Utica mine is a consolidation of the Brown, Confidence, Dead Horse, Jackson, Little Nuggett, Raspberry, Stickle, Utica, and Washington claims. The surface of the Utica claim was mined during the early part of the gold rush, and the ore was treated in arrastres. The Stickle claim was active during the 1860s. In 1871 it had been developed to a depth of 240 feet and was equipped with a 10-stamp mill (Mining and Scientific Press, 3/18/71, p. 163). The Confidence claim was active in the 1880s, and its ore was treated in a five-stamp mill.

Later C. D. Lane gained control of the Utica claim. Hobart and Hayward, who controlled numerous mines in the area, were brought in as partners during the 1880s, and shortly afterward the Utica Mining Company was organized. The other claims that now constitute the property were gradually acquired, and the mine was developed on a major scale. During the 1890s the Utica was one of the most productive gold mines in the nation —the output from January 1893 to September 1895 was $4,154,026 (Logan, 1934, p. 150). More than 500 men were on the payroll. Operations continued until late in 1915 when the mine was shut down. Except for mill cleanups and small amounts of gold recovered from the dump in the 1930s, the mine has been idle since. It is credited with a total production valued at nearly $17,-000,000 at the old price of gold (Bowen and Crippen, 1948, p. 55).

The ore bodies consisted of lenticular quartz-calcite veins separated by various thicknesses of fissured amphibolite, chloritic, and talcose schist. Both the quartz and nearby country rock contained free gold and auriferous pyrite. In the south portion of the mine the country rock is more highly sheared than in the north, and the ore bodies were complex networks of stringers and mineralized country rock. The grade of ore mined varied greatly, but the mill heads averaged $3.60 per ton or less at the old price of gold (Logan, 1935, p. 151). Occasionally small high-grade pockets were encountered. The vein system strikes northwestward and dips about 70° NE. Stoping widths ranged from 10 to 100 feet, and mining costs were low. Square-set stopes with waste filling and open stopes with pillars were employed.

The following geological information on the Utica mine is from the U. S. Geological Survey Mother Lode folio (Ransome, 1900, p. 9): "The lode upon which are located the Utica, Stickle, Lightner, and Bovee mines has proved exceedingly productive. Considerable calcite ("spar") occurs in the stringers composing the ore bodies. The richest ore is said to be the so-called "brown quartz" which is a fine granular aggregate of quartz, dolomite, and sometimes albite, thickly speckled with small crystals of pyrite. This "brown quartz" does not always form well-defined veins or stringers, but is very intimately associated with the country rock, and is in part an altered form of the latter. The other vein minerals are free gold, sericite, and a little chalcopyrite. Gold is not visible in most of the ore, but occurs in considerable masses in certain rich streaks.

"The ore body of the Utica mine is in the form of a stringer lead, consisting usually of numerous lenticular stringers lying nearly in the planes of schistosity of the amphibolite-schist, and separated by varying thickness of fissured and veined country rock. The stringers are largely quartz, but carbonates are also abundant, especially in the smaller fissures. The wall rock near the stringers is impregnated with pyrite, but the gold is said to occur chiefly within the quartz of the veins. The stringers dip easterly, as a rule, but are nearly vertical. Some rich specimens were seen in which the gold was embedded in a gangue of calcite. Pyrite was the only sulphide noted in the ore. Unfortunately, the attitude of those having the mine in charge was such that no satisfactory scientific examination of it could be made in 1897.

"The Stickles mine (now part of the Utica mine) adjoins the Utica on the south and is under the same management. As in that mine the country rock is amphibolite-schist, but it is in general more sheared and fissile than in the Utica. The ore body is a complex network of small stringers inclosing more or less impregnated country rock. True walls are lacking, and stringers occur in the country rock many feet away from the auriferous lead. The greater number of stringers follow approximately the planes of schistosity, but others traverse the schist in all directions. The ore body is separated into two longitudinal portions, or leads, by a horse of barren

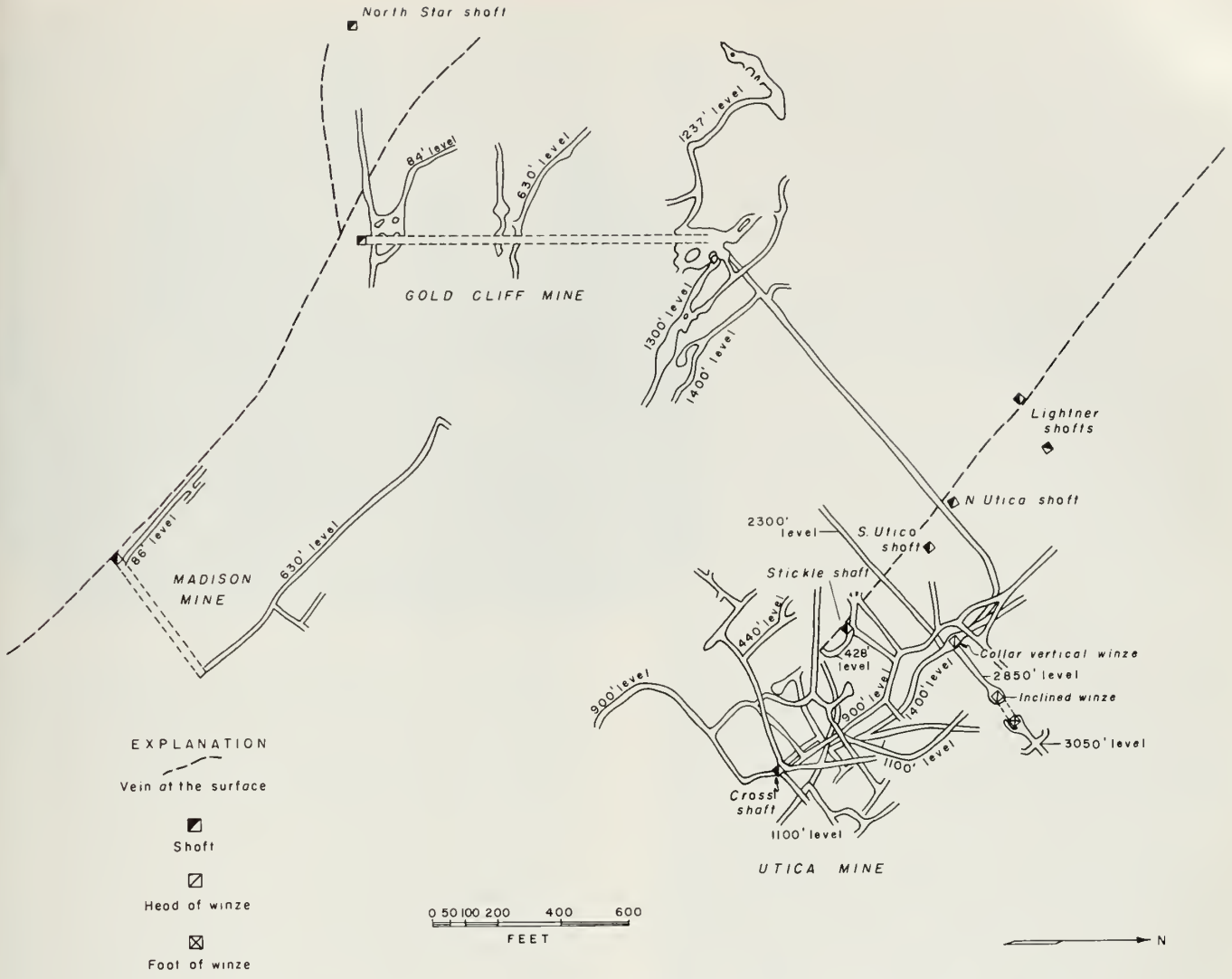


Figure 10. Map of partians af the warkings af the Gald Cliff, Madison, and Utica gald mines.

schist (and stringers) 30 to 50 feet in width. The westerly lead is the more important, being from 60 to 90 feet wide, while the eastern lead is only 20 or 30 feet. The leads and the horse, however, are very irregular.

"The filling of the fissures is sometimes quartz, sometimes carbonates, and sometimes a mixture of both. Pyrite and a little chalcopyrite were the only sulphides noted, the former being usually finely disseminated in small crystals through the vein material, and particularly through the impregnated schist between the stringers. The richest ore is said to be in the so-called "brown quartz" already described.

"At the 1000-foot level, the lowest worked in 1897, a mass of talc-schist was encountered near the shaft. This is apparently merely a portion of the amphibolite-schist series".

The mine is developed by the 1470-foot vertical Cross shaft, the 1000-foot vertical Stickle shaft some 650 feet to the northwest, and the north and south Utica shafts (see fig. 10). The Cross and Stickle shafts were the main working entries. Approximately 900 feet northwest of the Cross shaft on the 1400-foot level a vertical winze was sunk to the 2850-foot level. On this level a crosscut extends 300 feet to the northeast where an inclined winze extends to the 3050-foot level. This is the deepest portion of the mine, and the last work was done here. From the 1500-foot level in the winze a southwest crosscut is connected with the 1400-foot level of the Gold Cliff mine. There are more than 100 miles of underground workings (Tucker, 1916, p. 111), but only a portion of some of the levels is shown in figure 10. During the 1890s the ore was treated in a 120-stamp mill. In the later operations the ore was treated in a 300-ton mill equipped with 60 stamps and 36 Frue vanners. Both water power and water-generated electric power supplied by a company-owned water system were used. All equipment has been removed from the property.

Washington [Bullion Hill, McNair] mine

Location: [illegible] T. 4 N., R. 14 E., M.D.M., 4 miles south of Murphys on ridge north of Indian Creek. Ownership: Mary Jane Osselin, Sheep Ranch, California.

This was one of the more productive gold mines in the Murphys district. At one time this area was known as the Washington mining district and it contained the nearby Mar John, Western, Fenian, and Caruthers mines. The Washington mine was active prior to and during the late 1860s. In 1872 it was reported to be 150 feet deep, and ore containing $14 per ton in gold was being mined and treated in an arrastre (Mining and Scientific Press, 4/27/72, p. 260). Operations continued almost steadily until the early 1890s when the mine was shut down.

In 1909-10, the mine was dewatered by John Campbell (Mining and Scientific Press, 1/5/10, p. 141), but apparently there was little production. The Bullion Hill Mining Company leased the property in 1921 and erected a five-stamp mill that later was increased to 10 stamps. In 1922, approximately $5000 per month was being produced, but litigation caused this operation to cease in 1923 (Logan, 1925, p. 161). In 1924-25, some work was done on the property by the Washington Gold Mining Company, Jack Hubbard, president. Later, in the early 1930s, the property was explored by Dr. J. M. Carr of Stockton (Logan and Franke, 1936, p. 294), but it has been idle since. The surface plant was subsequently destroyed by fire. The mine has a total output of about $600,000 worth of gold at the old price (Henry Peterson, personal communication, 1958).

The strike of the main quartz vein ranges from N. 70° E. to due west; the dip is steep to the south. The vein ranges from 3 to 6 feet in thickness and is white to gray in color. The ore contained free gold and extremely abundant sulfides, chiefly pyrite and galena. In some places the ore contained as much as 10 percent sulfides (Logan, 1925, p. 160). The principal production came from two en echelon lensoid ore shoots that were stoped from the adit level nearly to the surface. Country rock is mica and quartz-mica schist. Associated with the vein is a fine-grained diorite dike.

The mine is developed by a 1,280-foot adit known as the 200-foot level which begins as a crosscut to the north and then drifts along the vein for much of its length; a 500-foot inclined shaft, which is connected with the adit; and a 400-foot inclined winze with crosscuts. The 10-stamp mill was equipped with Frue vanners and two Wilfley tables. Little equipment remains on the property, but the workings are partially accessible.

Whittle mine

Location: E½ sec. 14, T. 2 N., R. 13 E., M.D.M., 1 mile due west of the town of Carson Hill, by the Carson Creek road. Ownership: Henry Whittle et al., Angels Camp, California.

This gold mine is near the [illegible] margin of the Mother Lode belt. It was extensively worked from around 1889 to about 1895. In the Fall of 1[illegible] the mine had been developed to an inclined depth of [illegible] feet, and the ore was being treated in a Huntington mill (Mining and Scientific Press, 8/3/89, p. 93). Some work was done again sometime between 1910 and 1918, and the surface probably was prospected during the 1930s.

The quartz vein, which is 3 feet or more thick, has a strike of N. 35° W. and dips 70° NE. Country rock is phyllite with small amounts of green schist. Pyrite and calcite are abundant, both in the vein and the adjacent wall rock. Ore mined in 1889 yielded $10 to $12 per ton in gold. Considerable high-grade ore was reported to have been found near the surface when the mine was first opened. The mine is developed by two open inclined shafts 150 feet apart and several open cuts. Other than an old two-stamp mill, no equipment remains on the property.

Wilbur Womble mine

Location: W½ sec. 29, T. 2 N., R. 12 E., M.D.M., at the town of Hodson 3 miles northwest of Copperopolis. Ownership: Joseph Bertatta et al., Douglas Flat, California.

This West Belt gold mine was active prior to and during 1896 when a 17-foot vein was encountered on the property (Mining and Scientific Press, 11/21/96, p. 426). A 15-stamp mill was erected in 1902, but little is known of subsequent operations. In 1914 the mine was in the process of being reopened by the Hodson Mining Company (Tucker, 1916, p. 113). Sometime prior to 1925 the Gold Knoll Mining Company was organized to work this and other nearby properties (Logan, 1925, p. 153). A new shaft was sunk and some development work done. In the latter 1930s, the mine was worked by Alfred Meyers of San Francisco (Logan and Franke, 1936, p. 261), but it has been idle since.

Native gold and auriferous pyrite are found in a mass of quartz stringers which cut Mariposa slate and schist. The ore zone, which ranges from 50 to 100 feet in thickness, strikes N. 40° W. and dips 35° NE. Altered basic dikes accompany the quartz on both walls. Approximately 150 feet east of the ore zone is a narrow belt of serpentine which trends about N. 40° W. In fault contact with the serpentine on the east are metavolcanic rocks of the Logtown Ridge formation. Surface sampling done in the latter 1930s revealed an auriferous zone 50 to 150 feet wide containing ore valued at $2.50 to $3.50 per ton in gold (Logan and Franke, 1936, p. 261). The mine is developed by an inclined 185-foot shaft and a glory hole that is approximately 200 feet long, 50 feet wide, and 100 feet deep.

Wolverine mine

Location: NE¼ sec. 21, T. 6 N., R. 13 E., M.D.M., just west of Wet Gulch and 2½ miles northwest of Glencoe. Ownership: Ruby Taylor et al., Railroad Flat, California.

The Wolverine gold mine was first worked sometime during the 1850s or 1860s. In 1871 it was owned by the Lewis Brothers and was developed by a 140-foot shaft and 300-foot adit (Mining and Scientific Press, 3/25/71, p. 178). Shortly afterward the property was taken over

Photo 25. Surface plant of the Woodhouse gold mine, West Point district. Camera facing north. *Photo by Mary Hill.*

by the Wolverine Mining and Milling Company, W. H. Taylor, president. The shaft was sunk to a depth of 300 feet, a 10-stamp mill was erected, and ore averaging $20 per ton in gold at the old price was mined. During this time the mine output was as much as $5000 per month (Mining and Scientific Press, 6/14/73, p. 373).

Little is known of subsequent operations at the time, but it was reported to have been a producer of rich ore during the 1890s (Logan and Franke, 1936, p. 294). The mine was prospected about 1918 (Jeffrey Schweitzer, personal communication, 1956), but there was no production. In 1925, some high-grade ore was produced (Ruby Taylor, personal communication, 1957). The mine was prospected again about 1932, and good ore was reported to have been found at the bottom level (Logan and Franke, 1936, p. 294). It apparently has been idle since.

The vein, which ranges from 1 to 5 feet in thickness, strikes N. 6° E. and dips steeply to the northwest. Country rock is mica- and quartz-mica schist which has a north-northwest strike and dips to the east. The mine has been best known for the appreciable quantities of high-grade "jewelry" rock that have been produced (Ruby Taylor, personal communication, 1957). The value of its total output is unknown.

The principal working entry was a 400-foot inclined shaft which is still open. There are several west crosscut adits, which are caved, and another shaft about 50 feet south of the main shaft. The ore was treated in several 10-stamp mills, one erected during the 1870s, and another in 1932, but both have been removed, and there is no equipment on the property.

Woodhouse mine

Location: N½ sec. 8, T. 6 N., R. 13 E., M.D.M., 3 miles southwest of West Point and just south of the crest of the ridge between the South and Middle Forks of the Mokelumne River. Ownership: Woodhouse Mining Company, c/o W. W. Gibson, 1015 Fruitvale Avenue, Oakland 1, California.

The Woodhouse gold mine was originally operated during the 1850s, and according to several local residents, nearly $2,000,000 was recovered by ground sluicing in the immediate area of the mine. It was active during the 1860s and 1870s and patented in 1873. Ore that yielded as much as $80 per ton at the old price of gold was mined in those days (Mining and Scientific Press, 9/3/70, p. 156). Charles Underwood purchased the property in 1875 and erected a 15-stamp mill (Mining and Scientific Press, 8/7/75, p. 84). Other than some work done during the early 1890s, the mine apparently was idle for many years following the 1870s.

In 1933, the mine was reopened by S. C. Mudgett and J. A. Flagg of Oakland (Logan and Franke, 1936, p. 294). The property was purchased by the present owner in 1934. The workings were rehabilitated, a mill erected, and the mine worked intermittently until about World War II. Apparently it has been idle since.

The Woodhouse vein ranges from 2 to 13 feet in thickness, strikes in a northerly direction, and dips 60° to the west. The quartz ranges from white to dark gray in color. Like the other mines in the area, the ore contains free gold and abundant sulfides, especially galena. Calcite is also present in the vein. Ore mined during the last operations was reported to have averaged $12 per ton in gold at the new price (Logan and Franke, 1936, p. 295). Country rock is granodiorite cut by dikes of medium-grained diorite.

The mine is developed by a 265-foot inclined shaft with levels at 90, 150, and 265 feet; and about 1300 feet of drifts. In the last operation, the ore was treated in a mill equipped with three Gibson impact amalgamators, tables, and apron plates. The shaft is open, and the mill building and several other buildings remain on the property.

Yellow Aster (Yellow Star) mine

Location: SW¼ sec. 5, T. 6 N., R. 13 E., M.D.M., 2½ miles west of West Point. Ownership: O. C. Brink and E. J. Nuhn, P. O. Box 1021, Stockton, California.

The Yellow Aster gold mine originally was worked during the early days of the gold rush. It was operated during the 1930s by several lessees including G. Furst and V. A. Noel of West Point. The mine was reopened in 1950 by the present owners and has been worked intermittently since. The value of the total output of the mine is estimated to be more than $100,000 (O. C. Brink, personal communication, 1957).

There are three gold-bearing quartz veins on the property, the Aster, China, and an unnamed west vein. The Aster vein averages 2½ feet in thickness, strikes N. 10° E. and dips 60° NW. It is associated with a diorite dike largely on the footwall side. The China vein, 60 to 100 feet to the west, strikes N. 10° E. and dips 30° to 60° NW. It averages 1½ feet in thickness. The west vein is 250 feet west of the China vein. It strikes north to N. 10° W. and dips steeply to the west. A small west-striking cross vein also is on the property. The ore contains free gold, galena, pyrite, and chalcopyrite. The free gold commonly is associated with galena.

The Aster vein is developed by a 600-foot drift adit. Two west crosscuts to the China vein have been driven and 300 and 400 feet in from the adit portal. There is also a 140-foot raise on the Aster vein which connects with older inaccessible workings, the extent of which is unknown. A 140-foot drift has been run on the China vein. The operators are driving a drift on the west vein, which was 30 feet long in May 1957. Milling-grade ore is stockpiled. The higher-grade material is hand sorted and the ore is shipped to the Selby smelter.

Placer Gold

Production. The total amount or value of placer gold produced in Calaveras County since 1848 is not known. Records kept prior to publication of "Mineral Resources of the United States" by the U. S. Geological Survey in 1880 were incomplete and often inaccurate, and from 1880 to 1896, published statistics did not separate placer and lode gold production. Since 1896, placer operations have accounted for approximately one-fifth of the total gold production from Calaveras County; for the preceding 48 years, however, the proportion must have been higher. Julihn and Horton (1938, p. 21) have estimated that the value of placer gold produced in Calaveras County prior to 1896 was "probably as much as $75,000,000". Production from this date through 1936 amounted to approximately $9,100,000 (Julihn and Horton, 1938, p. 15); placer production in the 20 years following possibly totaled about $7,600,000.

History. The first significant recovery of gold in Calaveras County occurred in 1848, after gold had been discovered in the Mokelumne and Stanislaus Rivers and their tributaries. It was in the summer of this year that a party of miners, including James Carson, George Angel, and John and Dan Murphy, entered the county from the north. The group prospected the streams as they worked southward, and finally disbanded near what is now Angels Creek. Carson went south to the present site of Melones, while Angel and others remained and began panning the surface gravels. The town of Angels Camp grew up, and by 1853 had a population of about 4500. Shortly afterward local placer mining died out and was replaced by lode mining.

When the group of miners disbanded, the Murphy brothers went to the present site of Vallecito, which was was called "Murphy's Old Diggins". Shortly after, they moved to "Murphy's New Diggins" (Murphys), and the Old Diggins came to be known as Vallecito, a name used by the local Mexican population. The ground at Murphys was so rich that local miners' regulations in 1849 limited each man to a single square claim 8 feet on a side. Mining was done by panning until the Fall of 1849, when rockers were introduced from Tuolumne County. In January 1853, the Union Water Company completed a 15-mile ditch that brough water to Murphys from the Stanislaus River. In September 1859, a bedrock flume to Murphys Flat was completed; this facilitated drainage and removal of tailings, and allowed the placer mines to be worked to a depth of 35 feet. Placer mining in this area flourished until 1863.

San Andreas was sparsely settled by a few Mexicans in 1848, although the first mining was not done until the Spring of 1850, by some Americans. Water was brought in by the Union Company in 1852, and the mines were in full operation a year later. In 1855, a Mr. Murray struck buried gravels of a Tertiary river channel on the north point of Douglas Hill, and sank a shaft. Although the last good surface placers were worked in 1857, there were more than 80 mines working the channels within 1 mile of town in July 1859.

Mokelumne Hill was settled in 1848. Three years later, a company of Frenchmen discovered a rich depoist on what later was called French Hill. This area, as well as those surrounding, was mined by hundreds of "coyote holes"—irregular, sparingly timbered holes that were dug to a depth of 100 feet, and around which excavated dirt and gravel were piled.

Discovery of placer gold was responsible for the founding and rapid settlement of many other towns in the county, including Poverty Bar, Middle Bar, and Big Bar on the Mokelumne River; Campo Seco, which was rescued from abandonment by the discovery of copper after the surface placers had been worked out; and Camanche, Jenny Lind, Milton, Calaveritas, Dogtown, West Point, and Railroad Flat.

The earliest placer mining in Calaveras County was by means of the miner's pan. In the Fall of 1849, rockers were introduced at Murphys, and soon were in use

throughout the county. This device was quickly supplemented and replaced by the long tom, introduced from Georgia, and the sluice box. Hydraulic mining was developed at Nevada City, and the use of this high-volume, low-cost method of mining soon spread throughout the Mother Lode region. By 1854, Calaveras County had 17 ditch systems, totaling 325 miles in length, to supply water for the hydraulic mines. Drift mining began in the county at San Andreas, in 1855, and increased steadily in importance until around the turn of the century.

Hydraulic mining remained the dominant method of gold recovery until shortly after 1884. This was the year that Judge Sawyer of the United States Circuit Court handed down a decree restraining the North Bloomfield Mining Company from discharging debris into the South Fork of the Yuba River. Hydraulic mines were steadily closed by injuctions based on this decision until, in 1893, the federal Caminetti Act created the California Debris Commission and forbade hydraulic mining that would injure navigability or lands in territory drained by the Sacramento and San Joaquin river systems. Some hydraulic mines in Calaveras County continued operating for a few years after this law was passed, but gradually their debris dams were filled, and by 1905 this form of mining had virtually ceased.

The first successful dredging operation in California was started in 1898 at Oroville by an open-link bucket dredge. Connected-bucket dredges were introduced in 1901. By the end of the next decade, dredging had spread to and was firmly established in Calaveras County. Operations centered around the Camanche and Jenny Lind areas. Dragline dredging came into prominence in Calaveras County and the State as a whole in the early 1930s. The value of gold recovered by this method reached its peak in 1941. Although it never threatened to displace bucket-line dredging as a source of income, it did allow the working of many small properties that were not rich or large enough to warrant the capital investment of a bucket-line dredge. The U. S. Bureau of Mines reports that, in Calaveras County during 1941, there were eleven dragline dredges, one connected-bucket dredge, one drift mine, and eight miscellaneous placer operations that included the use of power shovels, bulldozers, and stationary washing plants. War Production Board Order L-208, issued in October 1942, curtailed placer mining activity during 1943-45. The period 1946-54 in this county saw the use of seventeen dredges, one stationary washing plant, one suction dredge, and five drift mines.

Mining methods. Early placer mining in Calaveras County involved the use of simple hand equipment: a pick, shovel, and gold pan or batea. However, the capacity of a gold pan in the hands of a skilled operator is between only one-half and one cubic yard of gravel in 10 hours. The rocker and long tom, therefore, were natural steps in the effort to increase the amount of gravel a man could wash in a day. Next to be used was sluicing, a method in which gravel is washed by passing it through a long, three-sided, wooden trough called a "sluice."

Sluices are built with a slight gradient, and contain riffles along the bottom behind which particles of gold are trapped. In ground sluicing, gravel is excavated and carried through sluices by water that is not under pressure. Mining is done by allowing a stream of water to fall over a bank, washing material into the sluice, or by periodically releasing water from a storage reservoir situated upstream from the gravel. Monitors may be used to supplement the action of ground-sluice water, but if they perform most of the work, the method becomes hydraulic mining.

In hydraulic mining, a jet of water under high natural pressure is directed through a nozzle called a "monitor" against a bank of gravel in order to disintegrate it and wash it through sluices. Almost all types of exposed placer deposits can be worked by hydraulicking if sufficient water is available, but the capacity of the operation becomes limited if the gravel is cemented or clayey, if the bedrock is flat, or if disposal of tailings and water by gravity is very difficult. Hydraulicking is a low-cost method of mining: it yields a larger production per man than any other method except dredging, and requires a smaller initial investment than dredging. Considerable development work often is necessary in preparing a deposit for hydraulicking: water reservoirs, several miles of flumes, hundreds of feet of iron pipe, one or more monitors, heavy sluice boxes, and a tailing dam were standard equipment in most Sierran hydraulic mines.

A deposit of gravel usually is opened at its lower end, to facilitate movement of gravel and water by gravity. After the deposit is opened, the gravel bank is undercut by the monitor, allowing the overlying material to cave into the pit. As the cutting and sweeping capacity of a monitor generally exceeds the carrying capacity of the water used, extra water is provided by a flowing stream, called "by-wash," which is directed through the pit and into the sluices. Large boulders are either disintegrated by blasting, removed by a derrick, stacked on the pit floor by hand, or swept through the sluices. It was common practice to use more than one monitor in a pit. Usually one or more high-pressure monitors were used to cut the bank, while a lower-pressure monitor was used simultaneously to sweep gravel toward the sluices.

Deposits of gold-bearing Tertiary stream gravel in the Sierra Nevada, capped by volcanic rock or other barren overburden, have been exploited by means of drift mining. A body of such buried gravel may be opened by a shaft or an adit. Drifts usually are run on bedrock upstream from the adit portal or the shaft station so that water readily drains from the mine. Common practice is to prospect the buried channel by a drift along the lowest part of its trough; crosscuts are run to either rim, and raises occasionally are put up to explore for gold-bearing strata above bedrock. The actual plan of mining depends chiefly upon the width of gravel to be mined and the configuration of the bedrock.

In a narrow channel, the drift and faces may be simultaneously advanced across the full width of the pay streak. In a wide channel, one or two parallel drifts may

Photo 26. Toilings pile contoining abundont quortz pebbles ot Del Oro hydroulic pit near Mokelumne Hill. *Photo by Mary Hill.*

Photo 27. Close-up of tailings in Del Oro hydroulic pit. *Photo by Mary Hill.*

Photo 28. Headframe and washing plant at the Spring Valley drift mine, Valley Springs district. Camera facing east. *Photo by Mary Hill.*

be run to the limit of the deposit, and then small blocks of gravel are mined, retreating toward the shaft. A modified room-and-pillar method sometimes is used, but more commonly the roof is supported by widely spaced stulls. If the gravel is loose, extensive timbering may be necessary. In mining, "breasts" or long faces of gravel are either picked by hand or drilled and blasted, then shoveled into ore cars and trammed to the portal or shaft station. This type of mining is called "breasting."

Most Sierran Tertiary gravels are partially or wholly cemented, and it is necessary to distintegrate the gravel before washing it to recover the gold. This commonly was done by stamp mills before the early 1900s, but since then it has been accomplished at most mines by passing the gravel through a scrubber-trommel. A trommel consists of a slightly horizontally inclined revolving steel cylinder on the inside of which iron rails or other lifting devices have been attached. The gravel is introduced through the elevated end of the cylinder and is lifted and dropped several times before it passes onto the screen or punched-plate section of the cylinder at the lower end. Broken gravel that has passed the trommel is washed in combinations of sluices, screens, jigs, and tables. If the gravel is tightly cemented, it may be re-cycled through a crusher-and-screen unit before washing.

Extensive flat-lying, shallow, river-bar and alluvial-plain gravel deposits in which relatively small amounts of gold are evenly distributed are especially suited to dredging. Enough water must be available to float the dredge and wash the gravel; the dredged ground must be tight enough to hold water in the dredge pond; and the bedrock should be relatively smooth and decomposed. Other conditions favorable for dredging are the absence of overburden, cemented gravel, clay beds, large boulders, and living or buried timber. A temperate climate, allowing year-around activity, and availability of power and transportation facilities also are important.

Connected-bucket dredges were used almost exclusively until the early 1930s, when dragline dredges were introduced. A connected-bucket dredge can dig up to three times as deep as a dragline and is able to handle harder bedrock and tighter gravel. On the other hand, a dragline dredge requires less capital, is more flexible in its operation, is easy to move after a deposit has been worked, and requires only a relatively small pond to float the washing plant.

The most common type of connected-bucket dredge used in California has a washing plant consisting of a trommel, sluices, tables and/or jigs, and a stacker to dispose of oversize from the trommel. Digging is accomplished by a bucket ladder mounted in the bow of the dredge, which is swung slowly from side to side by winches and cables mounted near the stern and connected to deadmen on shore. An overhead winch above the ladder enables it to be raised and lowered as conditions require. Because the bucket ladder is in the bow and the tailing stacker in the stern, the dredge continually moves forward, carrying its pond with it. Sand is discharged into the pond through sluices, but does not impair the motion of the dredge.

Dragline dredges consist of a dragline on the shore that excavates gravel and dumps it into a washing plant that floats on a small dredge pond. The dragline retreats as it cuts away the bank on which it stands, and the wash-

Photo 29. Bucket-line dredge of the Isobel Gold Dredging Company at Jenny Lind, in 1919. This dredge was equipped with 6½-cubic-foot buckets and two stackers.

ing plant floats forward to stay within range of the dragline. The washing plant has a flowsheet similar to that employed on a connected-bucket dredge.

Other related methods of working placer deposits include suction dredges and stationary washing plants supplied by power shovels and trucks. Suction dredges have been used in California, but never successfully. Principal disadvantages are their low capacity and the ease with which feed lines become obstructed by clay, boulders, or sunken wood. Power shovels, trucks, and stationary or movable washing plants may be used if there is insufficient water for hydraulicking, if the deposit is too small to warrant the investment necessary for a hydraulic mine or dredge, or if the topography and condition of the bedrock do not permit other types of mining. A movable washing plant eliminates trucking charges and permits easy disposal of tailings. A stationary plant is structurally more sound and better designed than a movable plant, and in addition, feed to the gold-recovery equipment does not fluctuate when the shovel moves or stops, because the stationary plant has a larger feed storage bin.

Geology. Gold-bearing placer deposits that are economically important in Calaveras County are of three types: residual soil and weathered rock, Quaternary stream gravels and transported soils, and Tertiary stream and shoreline gravels.

Auriferous residual soil and weathered rock were commonly first worked by small-scale placer mining methods, and sometimes by hydraulicking. Such deposits were shallow, however, and soon depleted. If the bedrock from which they were derived was sufficiently rich, lode-mining was started. Many lode mines in Calaveras County began in this manner.

Quaternary streams and soils in meadows and "flats" were another easily accessible source of gold in the early days of the Gold Rush. Railroad Flat and Murphys Flat are Quaternary deposits that were worked by hand-methods and ground sluicing in the 1850s and 1860s. Gravels in Recent streams were mined on a small scale at Carson Creek, Middle Bar, and Dogtown, and on a larger scale later at Jenny Lind and Camanche.

Because of the diminishing yield from Quaternary surface placers since the early 1900s, Tertiary channels and shoreline gravels have assumed relatively greater importance in the economy of gold mining in the county. The Tertiary channels of Calaveras and other Sierran counties emptied into the Ione Sea, the shoreline of which has not been located precisely, although gravels along a northwest-trending belt between Wallace and Jenny Lind probably represent delta deposits of the Tertiary rivers.

The Tertiary Calaveras channel traces its origin to Cretaceous time, when the drainage was controlled by a series of subdued, parallel, north-northwest-trending ridges, breached in a few places to allow the streams to reach a shallow sea lying to the west. This system persisted into the early Tertiary, and was thus inherited by the Eocene streams. The subtropical climate and relative stability of orogenic forces during the early Eocene permitted deep weathering and decomposition of the rocks. Thus, when the Tertiary Sierran uplift began, the rejuvenated streams became loaded with fine quartz sand and pebbles which originated from the erosion of lenses and beds of chert and veins of gold-bearing quartz, together with clay derived from decomposed feldspar in the deeply weathered rocks. Finer particles in the stream load were washed into the sea, and today are found in the Ione formation as large deposits of clay interbedded with quartz sand.

Explosive volcanic activity beginning at least as far back as Oligocene time resulted in rhyolitic ash-falls over much of the northern Sierra Nevada. Rivers were dammed, forming numerous small lakes in which streams deposited weathered and altered ash which now is seen as layered "pipe-clay" overlying auriferous stream gravel. Newly developed rivers flowed over a pervasive volcanic cover, and were repeatedly interrupted by ejections of rhyolitic and, in Mio-Pliocene time, andesitic lava and mudflows. Because of this, the buried Tertiary channel systems are quite complex, generally consisting of a series of individual channels that are superimposed on and cross-cut one another. The age of any such series of channels may range from late Cretaceous (?) to Pliocene. Prospecting for and mining buried placer gold deposits in this environment must be done with care, as not all the channels are gold-bearing.

Fragments of rhyolite and andesite were caught up in new and old streams, and were carried toward the ocean along with fragments of quartz, granite, and metamorphic rock. Consequently these stream-channel deposits can be classified on the basis of their constituent rock particles as prevolcanic, intervolcanic, and postvolcanic; they can be further classified with respect to the periods of rhyolitic and andesitic volcanism, which were distinct from each other and were probably separated by a period of quiescence. This widespread volcanic activity did not cease until late Pliocene or early Pleistocene time. The latite of Table Mountain, the source of which probably was in Tuolumne County, is the most recent product of

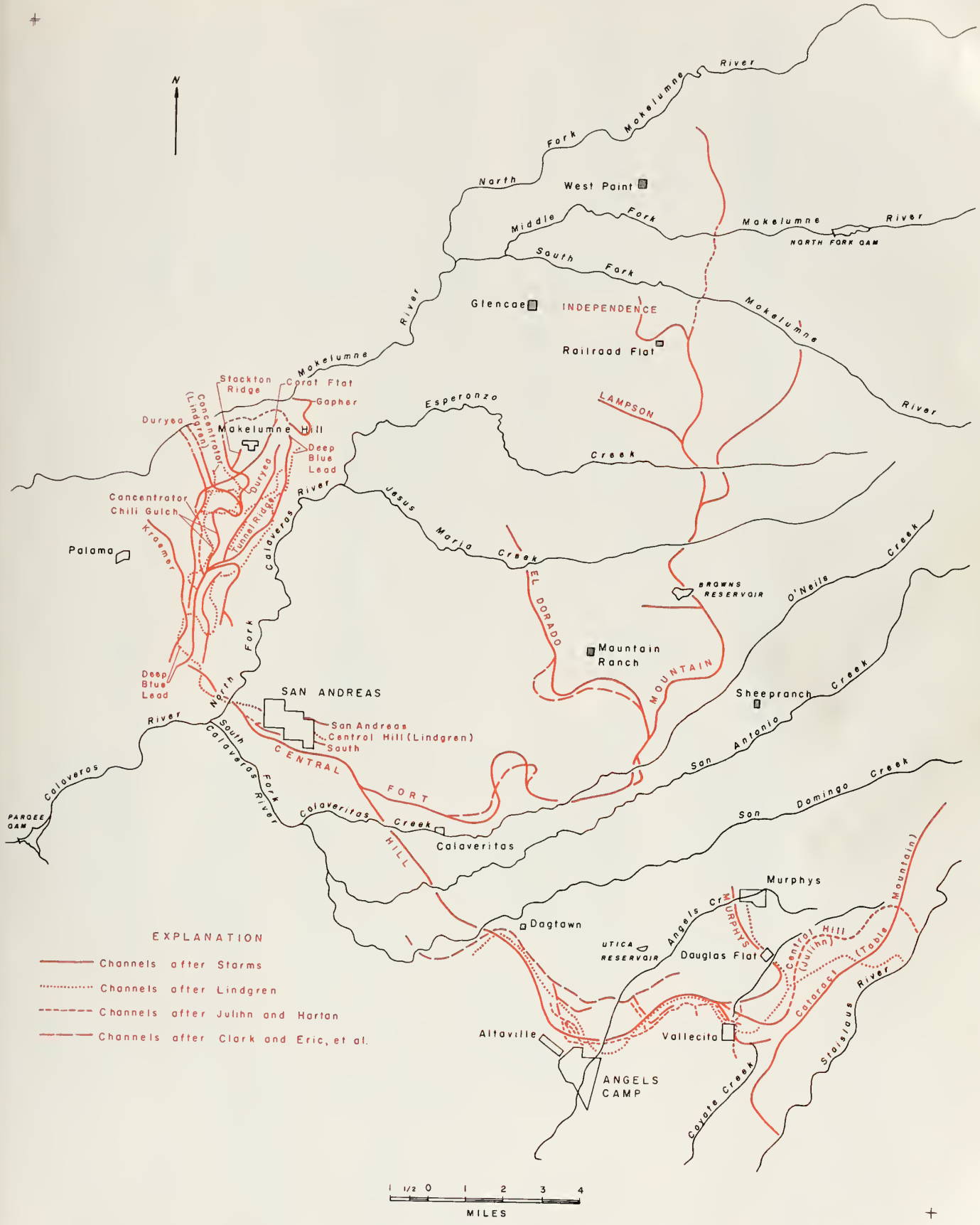


Figure 11. Map showing Tertiary channels in Calaveras County.

Table 2. Characteristics of the gold-bearing channels in Calaveras County

Channel	Gravel	Production	Age	Remarks
San Andreas System				
Central Hill	Thin, cemented auriferous gravel contains well-rounded metamorphic, granitic, and minor quartz pebbles; commonly cut or capped by rhyolite gravels. Boulders common, especially east of Altaville. Thickness variable.	More than $1½ million from Vallecito-Altaville area; locally rich elsewhere.	Pre-, inter-, and post-rhyolitic; pre-andesitic.	Channel generally narrow, steep; grade of 75 ft./mile flattens in Altaville-Dogtown area, and west of San Andreas .Faulting prominent west of Vallecito.
Murphys	Subangular pebbles of bedrock; up to 100 ft. thick.	"Reported yield of several hundred thousand dollars" (Julihn).	Prevolcanic	Tributary of Central Hill channel; narrow; grade 300 ft./mile.
Fort Mountain	Subangular pebbles of quartz and bedrock; Lindgren reports rhyolite gravel in places. Partly cemented, 6-8 ft. thick. Boulders common.	$1 to $4 per ton.	Prevolcanic and inter-rhyolitic (Lindgren).	Tributary of Central Hill channel; average width 100 to 200 ft. Grade 70 ft./mile north of Sheepranch, 100 ft./mile west of town.
El Dorado	Coarse, angular, partly cemented gravel contains quartz and metamorphic pebbles; rhyolite gravel in upper portions; 7-16 ft. thick.	About 70 cents per yard.	Pre- and inter-rhyolitic.	Tributary of Fort Mountain channel.
Lampson				Tributary of Fort Mountain channel.
Independence				Tributary of Fort Mountain channel.
Combination (South and San Andreas)			Post-Central Hill.	Relation to Central Hill channel uncertain, but probably younger.
Columbia (?)	Largely quartz.	"Reported yield of nearly a million dollars" in Vallecito area (Julihn).	Prevolcanic	Tributary of Central Hill channel. Small remnant SE of Vallecito correlated with Columbia channel by Lindgren and Julihn. Grade slight.
Mokelumne Hill System				
Deep Blue Lead (Old Woman Gulch Lead)	Gravel, commonly cemented, contains pebbles of quartz and bedrock; 20 ft. thick. Boulders common. Inter-rhyolitic paystreak 50 ft. above bedrock rests on rhyolite tuff.	Average less than 0.1 oz. per ton.	Prevolcanic	Average width 200 ft.; grade of 100 ft./mile flattens near Central Hill. Largest channel of this system.
Tunnel Ridge	Coarse, subangular gravel contains quartz and metamorphic rocks; partly cemented. Thickness 30-40 ft. (Julihn), 70-75 ft. (Lindgren).	"Excellent values in high-grade gold", especially in north portion (Julihn).	Prevolcanic	Bench of Deep Blue Lead; large quartz crystals found S of Mokelumne Hill.
Concentrator	Pebbles of quartz and metamorphic rocks overlain by white sand and tuff; 4-6 ft. thick.		Prevolcanic	Tributary of Deep Blue Lead.

Duryea	Interbedded rounded quartz pebbles and quartz sand; 10-40 ft. thick.		Prevolcanic.	Bench of Concentrator channel.
Chili Gulch	Cemented bluish quartz pebbles and boulders; rhyolite pebbles at Chappellet mine (Lindgren).	Rich deposits of gold pirated from earlier channels.	Intervolcanic.	Possibly correlative N of Mokelumne Hill with Gopher channel. Meanders S from Mokelumne Hill; enters narrow gorge S of Chappellet mine; grade irregular. Faulted S of Chappellet.
Gopher	Five to 15 ft. of coarse, rounded, cemented prevolcanic gravel; overlain by inter- and post-rhyolitic gravels at Gopher mine.		Pre-, inter-, and post-rhyolitic.	Correlative with Chili Gulch channel; 60 to 100 ft. wide.
Stockton Ridge		Exceptionally rich.	Prevolcanic.	Gold in coarse flakes and nuggets.
Corral Flat	Mixed volcanic gravels contain pebbles of hematite and boulders of bedrock banded with hematite.	Rich.	Intervolcanic.	Average width 50 to 75 ft.
Kraemer	Similar to gravels of Concentrator channel.	Minor commercial importance.	Prevolcanic.	
Cataract (Table Mountain)	Gravel thin and spotty; contains quartz, rhyolite, possibly andesite (Lindgren).	Channel of little economic importance.	Post-rhyolitic and pre-andesitic (Julihn); inter-andesitic (Lindgren).	

this activity preserved in Calaveras County. It overlies much of the Cataract channel, which, because of its westward trend, probably is younger in age than the Calaveras system of channels.

A time of extensive earth movements followed during the Pleistocene, as the Sierran block was once more uplifted and titled westward. Within the western foothills, smaller faults displaced some of the buried Tertiary channels and changed their apparent grade. Accelerated stream flow resulting from the westward tilting of the Sierran block eventually established a drainage system that cut westward across the general structural trend; some of these new streams cut deep and rugged canyons that are little changed today. Buried Tertiary stream gravel was exposed and partially removed by these new rivers, and gold contained in it was pirated and washed into the newer streams. Many of the very fine particles of gold were swept to the edge of the Great Valley and deposited with mixed Quaternary gravel to form the present dredging grounds.

The Tertiary channels of Calaveras County have been discussed in detail by Storms (1894), Lindgren (1911), and Julihn and Horton (1938), and in less detail by others. A brief summary of the principal characteristics of each of the 18 named channels appears in table 2.

W. H. Storms published the only detailed map of the Tertiary channels in Calaveras County that attempted to cover the whole county. Lindgren's maps were confined to the Mokelumne Hill-San Andreas and Dogtown-Murphys areas; Julihn and Horton published a detailed map of the channels betwen Altaville and Vallecito. Lorin Clark (1954) and J. H. Eric et al. (1955) published detailed geologic maps of the Calaveritas and Angels Camp quadrangles, in which the disposition of erosion remnants of Tertiary river gravel were accurately noted. None of these authors has been in complete agreement with the others; figure 11 is a map of the courses of the various channels as interpreted by each of them. Small-scale maps of the major channels have been published by C. S. Haley (1923), Don Steffa (1932), and Olaf Jenkins (1932).

Altaville mine

Location: NW¼ sec. 21, T. 3 N., R. 13 E., M.D.M., 1 mile north of Angels Camp. Ownership: Alta Mining Company, Inc., Altaville, California; George Schmauder of Altaville, lessee.

The Altaville drift mine was first developed during 1939-42, when a 358-foot vertical shaft was sunk, from the bottom of which about 400 feet of drifts were driven. Between 1942 and 1949 the mine was inactive. From 1949 until the spring of 1953, the Alta Mining Company and later the Gold Bar Mining Company operated the mine intermittently. In 1950 and 1951, 300 feet of drifts were driven from the old workings, and 1200 feet were driven on an upper level at 341 feet. George Schmauder has leased the property since early 1953. In April 1956 pumping ceased, and the mine was allowed to fill with water.

This mine is on the Central Hill channel, about a mile downstream (northwest) from the Calaveras Central drift mine. The gravel is well cemented and consists of boulders and cobbles of chert, quartz, granitic rock, and schist; it rests on greenstone and schist of the Calaveras formation. The bedrock is about 350 feet below the sur-

Photo 30. Headfrome of the Altoville drift mine, 2 miles north of Altoville. Comera focing east. *Photo by Denton W. Corlson.*

face; the total width of the channel is unknown. Gold is 888 to 900 fine, and ranges in size from flour to flat, pea-sized nuggets. Small amounts of platinum also have been recovered.

Atlas Gold Dredging Corporation

Location: Secs. 11, 12, 13, and 14, T. 4 N., R. 9 E., M.D.M., 1 mile southwest of Camanche. Ownership: Company inactive since January 5, 1949.

A dragline and floating washing plant worked on 240 acres leased from Calaveras Gold Dredging Company between late 1935 and early 1937. The dragline had a 2½-yard bucket; the washing plant consisted of a 33½-foot trommel, 700 square feet of sluices, Bendelari jigs, and a 70-foot stacker.

An average of 20 feet of Ione shoreline gravel covers about half of the property. Sampling was said to have revealed 4 million cubic yards of gravel averaging 15 cents per yard in fine gold, much of which was rusty (Julihn, 1938, p. 88). A small proportion of platinum also was found in the black-sand concentrates. The gravel is tight but infrequently cemented, and contains no large boulders. It rests on a bedrock of gray volcanic tuff.

Calaveras Central mine

Location: Portions of secs. 21, 22, 23, 26, 27, and 28 (480 acres); main working shaft (Reiner) is in SW¼ NE¼ sec. 28, T. 3 N., R. 13 E., M.D.M., about 1 mile north of Angels Camp. Ownership: Calaveras Central Gold Mining Company, Ltd., c/o Harry Sears, Trustee, Angels Camp, California.

The Calaveras Central mine is a consolidation of the Victor, McElroy, Aetna, and Slab Ranch properties, which were acquired by the Calaveras Central Gold Mining Company, Ltd., in the years 1931 to 1933. Each of these properties was prospected and developed before the turn of the century, although only the McElroy was worked intensively from the first (see Victor and Slab Ranch, herein, and McElroy and Aetna, tabulated list).

The Victor mine was purchased in 1926 from the Victor Canal and Mineral Co. by the Calaveras Central Mining Corporation, which carried on some early development work. In 1930, Calaveras Central Gold Mining Co., Ltd., was incorporated in Nevada, and the following year leased a few hundred acres, including the Victor or Reiner mine, from the Calaveras Central Mining Corporation. Other properties were acquired shortly thereafter, until the company controlled mining rights to the McElroy, Aetna (Peirano), Slab Ranch (Calmo), and E. W. Johnson Ranch properties. The 300-foot Victor (Reiner) shaft was reconditioned for use as the main working shaft, and the 240-foot Aetna shaft was retimbered and connected underground with the main workings to provide ventilation and an emergency exit.

Geological features of the Victor, McElroy, Aetna, and Slab Ranch mines are closely related. Gravels include those in at least three pre-volcanic channels, several poorly defined intervolcanic channels, and Recent surface gravel. About 500 feet east of the Slab Ranch mine

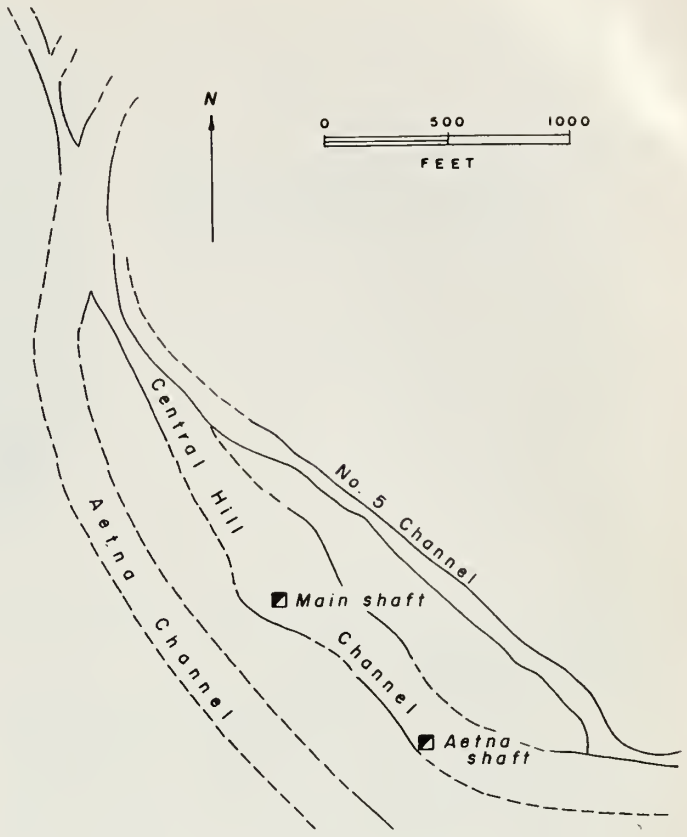


Figure 12. Map of principal channels of the Calaveras Central drift mine.

shaft, the bedrock rims of the Tertiary Central Hill river channel are less than 500 feet apart. The channel widens rapidly downstream, however, and within a mile forms a shallow basin about 1½ miles wide. The Tertiary river flowed west at the Slab Ranch mine, but on entering the basin it swerved to the northwest, and by so doing cut several distinct channels separated at places by bedrock ridges. Three bedrock channels have been explored (see fig. 12), and a fourth may lie to the northeast. The Aetna is the youngest of the known channels cut by the Tertiary Central Hill River, and at one point the Aetna and the main channel have apparently merged. The Central Hill channel also cuts the No. 5 channel in two places. The fourth channel to the northeast might represent an older bed of the Tertiary Central Hill River.

The Aetna channel, which is thought to have entered the basin from the south through a gap in the rimrock, might not be one of the main channels of the Tertiary river. Its gravels contain a larger proportion of quartz sand and boulders than do the other channels, and its gold is finer-grained and less worn; many pieces with quartz matrices indicate travel over a short distance. In contrast, gold in the Central Hill channel is well worn, is of large size, and generally is identical in character with that from the Vallecito-Western and Golden River mines upstream. The Central Hill channel thus appears

Photo 31. Calaveras Central drift mine, Angels Camp district: headframe, washing plant, and stacking belt. Camera facing southeast. *Photo by* Denton W. Carlson.

to have been formed by the Tertiary Calaveras River (Julihn and Horton, 1938, p. 45).

Several intervolcanic channels, of which little is known, overlie the bedrock channels in the basin. The McElroy is the only such channel to have been worked. It enters the basin from the south and is west of the Aetna channel, and may have derived its gold from erosion of auriferous quartz veins in the Angels Camp-Altaville area. No lava flows are found in the basin, but two distinct layers of rhyolite tuff and a later one of andesitic tuff are recognized.

Gold generally is found within the lower 5 feet of gravel and the upper 2 feet of bedrock, which is slate and schist of the Calaveras formation. The width of pay gravel ranges from 50 to 70 feet in the No. 5 channel, and from 150 to 250 feet in the Central Hill and Aetna channels. The gravel of the Central Hill channel consists of tightly cemented, well-rounded pebbles, cobbles, and boulders of granite, granodiorite, and quartz. The gold is between 885 and 900 fine because of its silver content, and much of it is larger than 10 mesh in size. Most of the gold is well worn. At places it is mixed with gold of less fineness that possibly was introduced by other channels. In both channels, it is associated with considerable pyrite and a little black sand. Gold in the No. 5 channel is smaller in size than in the other two channels, and its vertical distribution through the gravel is greater. There is little bedrock enrichment, but layers of sand as much as 30 feet above bedrock are gold-bearing.

Starting in June 1931, a crosscut from the station of the main shaft was driven 520 feet northeast, where No. 5 channel was intersected. This channel, which carried fine and medium-coarse gold, was explored for 1600 feet upstream, where it is partially cut off by a deeper channel, apparently part of the Central Hill channel. From 1934 to 1936, inclusive, most activity was confined to the Central Hill channel, which was followed downstream 2700 feet from the main shaft. The Aetna channel cuts through this channel 1500 feet from the shaft. These three channels are the principal ones that have been developed; approximately 30,000 feet of workings have opened more than 4000 feet of channel. Development work continued intermittently until the mine was closed in 1942. Gravel from the old tailings was processed and used for plant-mixed road surfacing in the early 1940s. Rehabilitation of the property began in 1947. Since 1950, a 600-tons-per-day mill, new surface equipment, and a 110-foot steel headframe have been installed, some of the old workings have been reopened, and the main and safety-exit shafts have been retimbered.

The total yield of the mines in which the Calaveras Central Gold Mining Co., Ltd., has an interest is reported to have been 2000 ounces of gold from 1900 to June 1931, and 20,000 ounces in the 6 years following. Since 1946, development work has yielded only a small amount of gold. From June 1931 to 1937, about 185,000 tons of material were mined, of which 25 percent was waste bedrock. The average recovery during this time was $4.94 per ton. Moreover, re-treatment of 12,000 tons of fine tailing yielded an additional $1.35 per ton (Julihn and Horton, 1938, pp. 43, 47-48).

Most of the underground drifts have a cross-section of 6 by 7 feet, and require little or no timbering. Mining equipment includes lightweight jack-leg drills, mucking machines, drag scrapers, 2½-ton ore cars, and a compressed-air locomotive. A chisel bit for drilling and 40-percent powder for blasting are used to advance the drifts. The mine makes about 250,000 gallons of water per day.

The mill is designed to separate a clean gravel for road-building material as a byproduct of the gold recovery. Auriferous gravel is hosted to the surface through the main shaft and tripped into a 250-ton circular ore bin on the headframe. The gravel is fed to a 2-inch

grizzly; the oversize is crushed to minus-one inch and screened to ¼ inch. Screen oversize goes to a belt conveyor and is stacked for future use as clean gravel; the undersize is passed over wooden riffles and sent to a Yuba jig. Minus-2-inch gravel from the grizzly is fed to a 5- by 8-foot inclined scrubber-trommel. Slotted discharge openings in the wall allow passage of minus-⅜-inch material; oversize is sent to the belt conveyor and stacked with gravel from the crusher. Trommel undersize is passed over wooden riffles and the Yuba jig. A concentrating table makes a final cleaning of the sand, which is then stockpiled for future use.

As work at the mine since 1950 has been limited to underground rehabilitation and surface improvements, the mill has been operated on only a pilot-plant scale.

Coffee Mill (Gleason, Golden Gate) mine

Location: SW¼ sec. 26 and NW¼ sec. 35, T. 5 N., R. 11 E., M.D.M., on east slope Golden Gate Hill, 4 miles southwest of Mokelumne Hill. Ownership: Eunice N. Van Winkle and Edmund J. Stocker, 2631 Robbindale, Stockton, California.

The Coffee Mill drift mine, on the Kraemer channel, was first active in 1866, when a 400-foot inclined adit was driven. A pay streak 100 feet wide was struck, and by 1868 a 10-stamp mill had been erected. Production of gravel, in which coarse nuggets were found, reached 200 carloads per day, but the mine was closed by excessive water in 1869 and again in 1871. A new inclined adit and main drift were driven 1500 feet during 1880-82. The mine was closed briefly, and in 1884 yet another adit was driven a distance of 800 feet. The property then was idle until 1892, when a 200-foot vertical shaft and a 25-foot east-trending drift tapped 6 feet of blue cemented gravel. A steam hoist was used at this shaft in 1896. The Coffee Mill was shut down ,before 1900, and was not actively developed thereafter except for retimbering of a 900-foot tunnel in 1915.

Duryea (Shaw) mine

Location: NE¼ sec. 13, T. 5 N., R. 11 E., M.D.M., in Chili Gulch, 1½ miles south of Mokelumne Hill. Ownership: Not determined.

This property was first active as the Shaw hydraulic mine from 1866 to 1871. James Duryea worked it from 1872 to 1876, using a monitor with a 3-inch nozzle to wash a bank 160 feet high, which was regularly loosened by blasting. Overburden became increasingly difficult to handle, so a 5-stamp mill was purchased in mid-1876, and drifting was begun. This drift mine remained active until the mill was sold in 1911. It has not been developed since.

The Duryea channel courses through this property and trends southwest. It is 100 feet wide, and contains 30 to 40 feet of rounded quartz gravel and clean sand overlain by 10 to 20 feet of compact quartz sand, rhyolitic flows and tuff, and andesitic tuff and breccia. This mine is said to have yielded $500,000 by hydraulicking.

Underground workings include a 2000-foot and a 700-foot adit, a 300-foot crosscut, several shorter adits, and breasts as much as 14 feet high.

Golden River mine

Location: SW¼ sec. 19, T. 3 N., R. 14 E., M.D.M., three-fourths of a mile northwest of Vallecito. Ownership: T. E. and E. K. Stearman, Vallecito, California.

The Golden River Mining Company, organized by Roland R. Woolley in 1933, acquired several leases on property in the Vallecito area from the Thomas Bishop Company that year and surrendered them in 1950. This property was subsequently sold in parcels to various new owners. The Golden River drift mine was active from 1933 to 1938, during which time more than 5700 ounces of gold were recovered (Roland Woolley, personal communication, 1957). The character of the gravel is the same although the gold is much coarser than in the Vallecito-Western mine, which is adjacent downstream. Nuggets as much as 2 inches in greatest dimension were common. Gold is in crevices in the bedrock and in partly cemented pay gravel. The pay gravel, which is from 40 to 150 feet wide and from 4 to 10 feet thick, contains many boulders. It rests on a dominantly granitic bedrock and is disrupted by extensive faulting that has caused vertical offsets of bedrock as much as 16 feet in height. To avoid these offsets, an 1800-foot main haulageway was driven in bedrock beneath the channel, and raises were put up to intersect the gravel at various points. The gravel is capped by rhyolite tuff.

Development includes a 310-foot vertical shaft, more than 2000 feet of drifts upstream (east), and 1000 feet of drifts downstream. In 1937, a second shaft, 232 feet deep, was sunk 1 mile east of the first shaft. Gravel was washed in a 40-foot scrubber-trommel and 300 feet of sluices. About 90 percent of the gold was recovered in the first 10 feet.

From 1935 to 1938, subleases were let on portions of the surface near Vallecito, and dredging operations there recovered an estimated $200,000 above the amount credited to the mine (Roland Woolley, personal communication, 1957). In 1958, several shallow drill holes sunk by Joseph Mancuso Jr., a lessee from Mr. Stearman, revealed a modest amount of medium-coarse to coarse gold in surface gravel (Ted Fisher, personal communication, 1958).

Green Mountain (Calaveras Crystal, McSorley Crystal) mine

Location: S½NE¼, and N½SE¼ sec. 24, T. 5 N., R. 11 E., M.D.M., about 2 miles south of Mokelumne Hill, north of and adjacent to the Rough Diamond drift mine. Ownership: R. P. M. Davis, 666 Rudd Street, Vista, California.

The Green Mountain mine was first active around 1874 when it was worked as a drift mine. By 1884 two adits, one 1200 feet long and another to the north 800 feet long, had been driven, although work had been confined to the northern adit since 1877. In 1885 the northern part of the property was worked by two east-trending adits 300 feet apart and each 900 feet long, connected by ventilation drifts. Near the east rim of the channel drifts were run 60 to 70 feet north and south. Gravel between drifts was breasted to a height of 6 feet at the farthest point, from which the work was carried toward the

adits. The cemented auriferous gravel was treated in an eight-stamp mill at the rate of 70 carloads per day.

Large quartz crystals and opalized wood were reportedly found prior to 1896, and 12 tons of crystal valued at $18,000 were mined and shipped in 1897-98. Between 1895 and 1900, a different portion of the property was intermittently hydraulicked by two operators, who removed a total of about 11,500 yards of gravel. In 1908, the mine failed to yield gold, but $10,000 worth of gem-quality quartz crystal was recovered. The Green Mountain mine was idle between 1910 and World War I, but by the end of that war had produced 22 tons of crystals, the largest of which was 6 feet long and weighed 2800 pounds. The next recorded activity was in 1925, when a 700-foot drift was driven on the Green Mountain Extension; a small amount of gold was produced in 1926. In 1934 intermittent exploration for quartz crystals ceased and was not resumed until May 1943, when the property was operated as the Calaveras Crystal mine. By June of that year the exploratory drift was 675 feet long, and 300 pounds of quartz crystal had yielded 90 pounds of saleable material. Quartz production continued through 1944, but none has been reported since. In 1945 a small amount of gold was recovered.

The Green Mountain and Rough Diamond properties are on the Tunnel Ridge channel, which flowed southwest at the time its gravel was deposited. This channel is truncated 900 feet north of the mines by a younger channel that contains a thin section of basal gravel capped successively by rhyolitic ash and andesitic cobbles and ash. The Tunnel Ridge channel cuts greenstone and slate of the Calaveras group and is filled entirely by gravel, which here is 1200 feet wide and 285 feet thick. The lower 125 feet of gravel has a matrix of sand and clay and is poorly cemented; the upper portion has a clean sandy matrix and is well cemented. In the lowest 10 feet of gravel, the average size of cobbles is 5 to 6 inches, although boulders as much as 3 feet in diameter are common on the bedrock surface. The gravel itself is in individual beds a few inches to 6 feet thick, and is composed chiefly of well-rounded quartzite, vein quartz, and quartz schist, with lesser amounts of altered slate, greenstone, mica schist, and serpentine.

In the vicinity of the mines the main channel axis describes an arc; north of the mines it trends west, and to the south it trends south. A small tributary stream joined the main channel from the northwest immediately southwest of the southernmost workings; another small tributary may have joined the channel from the east just north of the Rough Diamond mine. A feature of economic importance in the mines is a small cliff located from 125 to 200 feet east of the channel axis. Its height ranges from 5 to 15 feet, and its slope ranges from nearly vertical to 45° W. Only a few quartz crystals have been found east of this cliff, and these were close to the ravine that entered the main channel from the east and may have entered the channel through this ravine. No crystals have been found west of the channel axis. The width of the crystal-bearing gravel is 200 feet in the Rough Diamond mine and only 70 feet in the Green Mountain mine. Crystals have been found as much as 20 feet above bedrock, although they are most abundant in the lower 6 feet of gravel. The majority of crystals recovered have been in gravel rather than sand, but are not confined to any particular layer.

The distribution of the crystals, together with their almost complete lack of wear, suggests that their source is a nearby hydrothermal vein that was cut and eroded by Tertiary streams. There is no evidence to indicate whether any part of this vein still exists, or whether it might still contain quartz crystals.

The workings of the Green Mountain mine in 1944 consisted of about 1000 feet of southeast- and south-trending drifts and crosscuts. Many hundreds of feet of older workings, of which there is little or no record, have been caved for several decades.

Hexter mine

Location: NW¼ sec. 13, T. 5 N., R. 11 E., M.D.M., 1 mile southwest of Mokelumne Hill. Ownership: John B. Fershtand, 1501 Summit, Fort Worth 3, Texas.

The main haulageway of this drift mine was driven S. 30° E. for 1400 feet during 1896 to 1899, but it was worked only intermittently during the following decade. The adit was retimbered in 1912 and reached a length of 3100 feet in 1914. That same year a 200 tons-per-day mill was erected and a 130-foot ventilating shaft was sunk. The adit was 3800 feet long when the mine closed in 1917. Other workings include drifts 500 feet north and 500 feet south along the channel.

Pay gravel of the Duryea channel, on which the Hexter is located, is 7 feet thick and 125 feet wide. It is slightly cemented and capped by flows of rhyolite and andesite. Soft opals of sub-gem quality have been recovered from this mine. In 1914 gravel was treated in a rotary mill, concentrating table, and 70 feet of sluices.

Jupiter (San Domingo, Keefer) mine

Location: SE¼ sec. 7, and NW¼ sec. 17, T. 3 N., R. 13 E., M.D.M., 3 miles north of Altaville. Ownership: Walter V. and Norma M. Valente, Angels Camp, California.

This property, located on the Central Hill channel, was worked with a 100-foot bank as the Keefer hydraulic mine in 1880 and as the Jupiter mine in 1882. Some drifting was later done here prior to 1896. The mine operated as the Jupiter and later the San Domingo from 1898 to 1902(?), when more than 226,500 cubic yards of gravel were hydraulicked. It was again active as a drift mine in 1903, when an 1100-foot adit was completed. In 1908 approximately 69,000 yards of gravel were hydraulicked. The property remained inactive until a 600-foot adit was driven upstream N. 70° E. during 1934-36.

The channel here trends almost due west; it is steep-sided and 125 feet wide. Slightly cemented gravel containing some boulders rests on a slate bedrock. About 2 feet of bedrock were mined with the gravel during the

Photo 32. Melones suction gold dredge on the Stonislous River opposite the town of Melones. Blocky greenstone is in the foreground. Comero focing south.

Photo 33. Woshing plont of the Mountoin Gold Dredging Compony ot Double Springs 3 miles east of Valley Springs. The Spring Valley drift mine is in the bockground. Camera focing north.

drifting operations of 1934-36. The washing plant at that time consisted of a 4½- by 18-foot trommel-screen, a sluice box, and a stacker.

Lloyd (Watson Bros.) mine

Location: SE¼ sec. 2 and NE¼ sec. 11, T. 4 N., R. 11 E., M.D.M., 3 miles northeast of San Andreas, east of Latimer Gulch. Ownership: Lottie C. Jackson, Box 74, San Andreas, California.

This drift mine on the Central Hill channel was described in 1873 as "two-fifths drifted out" through a 44-foot shaft. An 800-foot adit was used to drain the mine. An arrastre treated 12 tons of gravel per day. A 5-stamp mill on the property, which formerly crushed gravel, was used for custom milling. The Lloyd mine was again active in the early 1900s and during 1932-39.

The channel contains 8 feet of pay gravel consisting of schist, slate, and quartz. It rests on blue slate and is capped successively by 2 feet of volcanic mud, 20 feet of ash, a sequence of mixed ash and gravel, and 50 feet of sand and gravel. A younger cross-channel north of the inclined shaft trends N. 20° W. It contains diorite and quartz cobbles and has cut down below the Central Hill channel. The bedrock of the Central Hill channel pitches gently south, but water flowed north during the Tertiary period. In 1934 some 12,000 tons of gravel yielded 802 ounces of gold and 124 ounces of silver. Gold is 875 fine; its size ranges from "pin-head" to "wheat-grain". In the 1930s 1½ feet of bedrock and 5 feet of gravel were mined.

Workings consist of a 300-foot adit inclined 33° E., a 750-foot drift north from the shaft station, a 200-foot drift northwest on the younger channel, drifts to the east from the shaft station and north workings, and breasting west of the main (north) drift. In 1937 a vertical shaft 100 feet north of the incline was sunk to a depth of about 85 feet, and gravel was drifted to the east and south. During the 1930s gravel was treated in a 4- by 14-foot scrubber-trommel, sluices, a rake classifier, and a cone classifier.

Neilsen placer

Location: NW¼ sec. 25, T. 5 N., R. 11 E., M.D.M., about 2½ miles south of Mokelumne Hill, in Chili Gulch. Ownership: Neilsen Sand and Gravel Co., c/o C. W. Neilsen, San Andreas; Ray Neilsen, manager.

This property was first worked sometime prior to 1900, when a large pit on the southeast side of Chili Gulch was excavated by hydraulicking, and a great mass of tailings was deposited in the gulch. The Neilsens reworked these tailings for a few months in early 1936 with a small 37-bucket dredge. About 60,000 yards of gravel were washed in a 4- by 12-foot trommel and sluices, and yielded between 10 and 15 cents per yard. Since 1939, the Neilsens have produced sand and gravel almost continuously from this property (see section on Sand and Gravel). A sluice with a quicksilver trap was installed in the aggregate plant late in 1957 to recover fine gold.

The gravel consists of virgin gravel of the Chili Gulch channel and hydraulic tailings piles on the east slope of Chili Gulch, and Recent stream gravel in the bottom of the gulch. The tailings, which were accumulated from the Tertiary stream channel, have a notably higher vein-quartz content than the Recent gravels.

The old hydraulic pit east of the aggregate plant was being prepared late in 1957 for mining the following Spring. Use of this virgin gravel was expected to result in an increased yield of gold.

Rising Star (Cassinelli) mine

Location: Part of NE¼SE¼, and part of W½SE¼, sec. 2, T. 4 N., R. 11 E., M.D.M., about 3 miles northwest of San Andreas, just east of Latimer Gulch. Ownership: Roy and Edna Byrns, 73 Los Banos Avenue, Daly City, California.

Gravel of the Deep Blue Lead was first encountered on this property in 1871 after a Mr. Mullen had driven an 1100-foot adit to a point 30 feet above bedrock. Subsequent drifting outlined the lateral extent of the pay gravel. It was reported in 1875 that a month's work yielded 160 ounces of gold. In 1892 the property was being prospected by a 1200-foot tunnel. The following year workings consisted of two shafts and a 1500-foot adit, which by 1900 had been extended an additional 300 feet. The gravel was estimated to contain $4 per ton in gold in 1896. The Rising Star mine was intermittently active from 1900 through 1916. Work during this period consisted of breasting the gravel, which was then treated by slacking and washing in a trommel and sluices. During 1920-25 and 1932-39 the mine was again prospected and developed. Work during the 1930s was south of the main adit on a channel known as the Blue Wash. A drift was run southward for 500 feet from the old Gleason workings in order to explore the east rim of this channel.

The Rising Star property lies across the Deep Blue Lead, which here consists of four separate channels that flowed slightly east of south over a relatively flat bedrock basin. From east to west these channels are the Lloyd, Mullen, Gleason, and Blue Wash. The basin occupied by these channels is 1200 feet wide. The gravel in all four channels consists of a heavy wash containing blue clay and many large boulders and cobbles. It is compact, sometimes cemented, and generally about 30 feet deep and 100 feet wide. It rests on a bedrock of slate, schist, and gabbro, and is capped by a breccia of andesite and rhyolite pebbles overlain by surface gravel. Gold ranges in size from medium to coarse and is found with considerable amounts of black sand and pyrite. It is chiefly in the upper 2 feet of bedrock and the lower 3 feet of gravel.

Workings in the Rising Star mine include two main ventilation shafts, the Mullen and Gleason, and more than 3000 feet of drifts and crosscuts. The entry adit of the main tunnel is situated 200 feet east of the east rim. The tunnel trends southwest for 800 feet, crossing the Lloyd channel and penetrating the Mullen channel. It is connected with the Mullen shaft, beyond which it trends

west for 700 feet, cutting the Gleason channel. Near the center of the Blue Wash the main tunnel swings southward and continues down-channel for about 650 feet. A series of crosscuts run to the west during the 1930s in this portion of the tunnel were said to have disclosed 100 feet of pay gravel. Blue Wash gravel was mined in the old days by breasting for 300 feet north of the main tunnel between the Foley and Gleason shafts. Another wide block of breasted gravel is in the Gleason channel and is the means by which the Gleason shaft was connected with the main tunnel 200 feet to the south. The Mullen channel was breasted south of the tunnel during the early life of the property. The Lloyd channel has not been worked from the main tunnel.

During the 1930s, gravel was treated in a 3- by 12-foot trommel and about 70 feet of sluices.

Rough Diamond mine

Location: Portions of SE¼ sec. 24, T. 5 N., R. 11 E., M.D.M., about 2 miles south of Mokelumne Hill. It is south of and adjacent to the Green Mountain drift mine. Ownership: Raymond and Mary J. Garamendi, Mokelumne Hill, California.

Prior to 1877 this property was worked as a hydraulic mine, but cemented gravel prevented recovery of much of the gold. A Mr. Garland purchased the ground in 1877, drove a 450-foot drift, and erected a five-stamp mill that handled 90 tons of gravel per day. The following year it was bought by Mr. Jillson, and during the next 4 years three small adits were driven, and the main adit was extended to 800 feet, from which points drifts were run 175 feet north and 350 feet south. Gold in the gravel is reported to have averaged $2.00 to $2.50 per carload in 1883. No further activity is recorded until 1934, when the property yielded a small amount of gold. It was inactive again until mid-1942, when exploration for quartz crystals began. Between September 1942 and November 1943, about 6600 pounds of crystal were recovered. Production of modest amounts of quartz crystal continued through 1944. During the latter part of that year, both the Rough Diamond and Calaveras Crystal properties were operated by the Quartz Crystal Products Company. No crystal production has been reported since 1944.

Statements regarding the earliest quartz-crystal production from the Rough Diamond mine (Julihn and Horton, 1938, p. 71) are not specific, and merely imply production prior to 1938. The name of the mine, which probably refers to quartz crystals found in it, was entered in the patent records in the late 1800s.

This property is on the Tunnel Ridge channel. Its geology is similar to that of the Green Mountain mine and is described under that heading. Reserves of quartz crystal in the Rough Diamond were estimated in 1944 to be 12,600 pounds in 9000 cubic yards of gravel. About 5 percent of this quartz would be of piezoelectric grade (Durrell, 1944, p. 432-433). A later report (Wright, 1950, p. 207) describes this deposit as "nearly exhausted".

Development of the Rough Diamond includes, besides the drifts of the 1870s and 1880s, about 1000 feet of drifts trending east and northeast, and a total of 43 feet of raises, driven in 1942-43.

Explosives were used in opening the Rough Diamond mine, but this practice was discontinued when it was found that crystals were being fractured, and pneumatic tools were used instead. As the result of pilot-plant tests conducted on the property from June to November 1944, a washing plant was erected on the Calaveras crystal (Green Mountain) property. This plant had a rated capacity of about 200 tons of gravel per hour, and consisted of a 35-foot trommel and sluices to recover gold; crystal would be recovered on a conveyor belt and in the pit. It was proposed to reach the crystal-bearing gravel with an open cut of 50-feet bottom width, using a bulldozer and power shovel.

Photo 34. Headframe and surface plant of the Slab Ranch drift mine, 1 mile east of Altaville. This mine is on the Central Hill channel. Camera facing northeast.

Slab Ranch (Calmo) mine

Location: NW¼ and SE¼ sec. 27, T. 3 N., R. 13 E., M.D.M., 1½ miles northeast of Angels Camp. Ownership: c/o P. N. Alexander, 1567 Hiawatha Avenue, Stockton, California.

This property, situated on the Central Hill channel, was prospected in the 1860s, but was not seriously worked until 1922. By late 1923 a vertical shaft 45 feet deep had been sunk. The Calmo Mining and Milling Company, later known as the Mound City Mining Company, sank two vertical shafts 167 and 115 feet, from which more than 8000 feet of drifts and crosscuts are said to have been driven in gravel and in bedrock in search of quartz stringers. This period of intermittent activity lasted from 1924 to 1933. The first shaft to be sunk was the Calmo shaft, downstream and north of the presently existing

Slab Ranch shaft. Approximately 1500 feet of drifts and crosscuts were driven, principally in the bedrock rims, and gold valued at about $25,000 was produced from the Calmo. After that the mill and mining equipment were moved to the Slab Ranch site, and a shaft was sunk in a narrow portion of a canyon in the Central Hill channel. No production from this shaft has been recorded. In 1933, this property was acquired by the Calaveras Central Gold Mining Co., Ltd.

The channel trough at the Slab Ranch site is between 70 and 125 feet wide, and at the Calmo site it is somewhat wider; gravel on the dump contains cobbles of schist, quartzite, basalt(?), and rhyolite. A small dump at the caved Calmo shaft, which was sunk on the north rim of the channel, is composed chiefly at subangular cobbles of schist. The Slab Ranch washing plant consisted of a 3- by 25-foot scrubber-trommel and sluices.

Vallecito Western mine

Location: SW¼ sec. 24, T. 3 N., R. 13 E., M.D.M., near Six Mile Creek, 2 miles west-northwest of Vallecito. Ownership: Thomas B. Bishop Co., 166 Geary Street, San Francisco, California.

In 1923 Donald Steffa and three other men ceased their activities on the Vallecito Consolidated property at the north end of the town of Vallecito and began prospecting the Central Hill channel in the vicinity of Six Mile Creek. They organized the Vallecito Mining Company, obtained a lease on 285 acres of property from the Thomas Bishop Company, and began drilling in May 1923. By May 1924 seven holes totaling about 2000 feet had been drilled. From the information thus obtained, a cross section of the channel was made, and a site selected on which a 4- by 7½-foot shaft was sunk to a depth of 167 feet. The property was developed by 6300 feet of workings by the end of July 1931.

The Vallecito Western yielded 4,206 ounces of gold by 1933. From December 1932 to October 1936, the mine was operated under a sublease by the Tonopah-Belmont Development Company. From January 1933 to September 1936, 40,967 tons of gravel yielded 7,222 ounces of gold and 815 ounces of silver. In March 1935, a major fault was encountered in the main gangway about 3000 feet northeast of the shaft. The channel was cut off completely, and was not found again until the following December. The Vallecito Mining Company operated the mine in 1937 and recovered 358 ounces of gold from 1,213 tons of gravel. In 1938, 917 tons of gravel were mined, and 27,223 yards of old tailings were washed. A dragline dredge was operated on the property during 1939, and a sub-lessee recovered 274 ounces of gold and 31 ounces of silver from 687 yards of gravel obtained by drift mining. Vallecito Mining Company worked the mine again throughout 1940 and recovered 221 ounces of gold and 25 ounces of silver from 685 yards of gravel. Activity ceased on the property in 1941, and has not resumed.

The Vallecito Western mine is situated on a 275-foot-wide channel in a Tertiary valley that is approximately 1400 feet wide. A major fault completely offsets the channel about 3000 feet northeast of the shaft. Bedrock slate, amphibolite, and granodiorite are overlain by 15 to 70 feet of compact, uncemented gravel. The gravel is well-rounded and contains many large boulders in a matrix of cobbles and fine sand. Cobbles and boulders are composed chiefly of granitic rock; small proportions of slate, quartzite, jasper, and quartz also are present. Overburden consisting of sand, gravel, and rhyolitic ash ranges from 100 to 250 feet in thickness.

Pay streaks are concentrated in the main trough of the channel and on its south rim. Breasting was carried across the full width of the pay streak, which ranges from 40 to 150 feet. Pay streaks are uniform over long distances and are accompanied by only small amounts of black sand. About 75 percent of the gold is on, or within, 1 foot of bedrock, although pay streaks have been found as high as 23 feet above bedrock. The average breast height was 6 feet. Where there is gold well above the bedrock, there is usually very little near the base of the gravel.

The gold is in coarse, flat flakes up to 5 ounces in weight; about 90 percent of it is coarser than 20 mesh. The average size of the gold increased as workings were advanced upstream. Recovery of small amounts of crystalline and wire gold was reported in 1929. The fineness of the gold ranged from 882 to 900, and averaged 895.

The mine was developed by a 167-foot vertical shaft that includes a 14-foot sump below the shaft station, and more than 6300 feet of drifts and crosscuts. From the shaft, a diagonal crosscut was run southeast to a point near the north rim of the channel, and a drift was then run east parallel to the rim. Another diagonal crosscut was run southeast, beginning 250 feet from the shaft and extending to a point near the south rim of the channel, from which another drift was advanced to the east. Crosscuts between the parallel drifts were run at intervals of 100 to 150 feet, and other crosscuts were projected away from the drifts onto benches and up the rims.

Gravel was washed in a 3- by 18-foot scrubber-trommel, after passing through an 11-foot sluice where large cobbles were removed by hand. The trommel portion consisted of two concentric tubes of plate punched with 1½-inch holes on the inner tube, and ⅜-inch holes on the outer tube. Oversize gravel was passed through a sluice and over riffles. Undersize (minus ⅜-inch) was passed over riffles, onto a table, and over more riffles. Steffa reported in 1932 that 200 tons of re-washed tailings yielded only 17½ cents per ton; the gravel had originally contained $8.00 per ton.

Victor (Rainer, Reiner, etc.) mine

Location: NE¼ sec. 28, T. 3 N., R. 13 E., M.D.M., one-half mile north of Angels Camp. Ownership: Calaveras Central Gold Mining Company, c/o Harry Sears, Trustee, Angels Camp, California.

This property was first located in 1895, and reportedly was sold for $50,000 that same year. The shaft, which now is the main shaft of the Calaveras Central drift mine,

was sunk in 1904-05. The mine was worked intermittently by the Reiner Mining Company from 1908 until 1912, when fire destroyed the shaft and a 20-stamp mill. Work was resumed, and by mid-1913 bedrock was reached. About 1000 feet of drifts were driven by 1915, but a heavy flow of water in the lower levels closed the mine. The Victor Mining Company dewatered it and did some drifting in 1920-21. A small amount of platinum was recovered during this time from auriferous blue clay at the bottom of the 320-foot shaft. The Victor Land and Mineral Company worked the mine intermittently during 1922-26; drifts were driven east to the Central Hill channel, and small blocks of gravel averaging $5 to $6 per ton were mined south and northwest of the shaft. The property was purchased by the Calaveras Central Mining Corporation in March 1927, and remained idle until it was acquired by the Calaveras Central Gold Mining Company, Ltd., in mid-1931.

What Cheer mine

Location: NW¼ sec. 24, T. 5 N., R. 11 E., M.D.M., just north of the Buffalo drift mine, 2 miles southwest of Mokelumne Hill. Ownership: Theresa Murphy and Mary Garamendi, Mokelumne Hill, California.

This property was active prior to 1871, although nothing has been recorded regarding the nature of the work. An inclined adit and several drifts and crosscuts were driven during 1871-72, and a bedrock adit was driven in 1885. In 1887, a five-stamp mill was erected. Shortly afterward, the mine was closed; it remained idle, except for some activity in 1899-1902 and development in 1935-37.

The Deep Blue Lead trends due north of the What Cheer property. Gravel in the channel consists of 20 feet of slightly cemented well-rounded quartz pebbles and boulders on a slate bedrock, capped by 150 feet of volcanic ash; sand, clay, and pyrrhotite are common. Gold is fine-grained and approximately 900 fine. In 1937 gravel yielded $2 per ton in gold.

The latest development of this property was by a 285-foot vertical shaft situated 1300 feet south of an old 600-foot west-trending inclined adit. From the bottom of the vertical shaft, an 1100-foot timbered haulage drift was run north on the east rim of the channel; gravel was mined by inclined crosscuts to the trough of the channel. Between 40 and 50 acres of productive ground reportedly are still virgin (Averill, 1946, p. 254).

Gravel was treated in 1937 by a 14-foot scrubber-trommel, 50 feet of sluices, and a rake classifier. The capacity of this plant was 100 tons per day.

Iron

A number of small deposits of low-grade iron ore exist in Calaveras County. Years ago several were prospected in shallow open cuts and short adits, but no production was recorded. Probably the best-known deposit is the Big Trees mine, located in the SW¼ sec. 32, T. 4 N., R. 14 E., M.D.M., 1 mile due north of Murphys. It consists of siliceous hematite and limonite interbedded with quartz-mica schist, and much of it is covered with a thick soil overburden. Years ago a steel company examined the deposit, but it was reported to be too low in grade and too limited in extent to be of commercial interest (Henry Peterson, personal communication, 1958).

Several small bodies of limonite-bearing chert replacing limestone are in the Calaveritas quadrangle, and thin lenses of magnetite interlayed with antigorite are found 2 miles southeast of Esmeralda School in the NE¼ sec. 2, T. 3 N., R. 13 E., M.D.M. (Clark, 1954, p. 21). Other prospects in the county include the Detert or Iron Monarch prospect, a limonite hill-capping 1½ miles north of Valley Springs in sec. 11, T. 4 N., R. 10 E., M.D.M., and the Bonanza mine, 7 miles southeast of Mokelumne Hill (Logan, 1925, p. 162).

Lead

Appreciable quantities of lead have been produced in Calaveras County. Although the total recorded output for the county from 1880 to 1957 is 1,169,693 pounds valued at $122,198, considerable additional amounts were contained in ores shipped from the Penn mine, which were not included in the above figures. According to production figures shown in the U. S. Bureau of Mines Minerals Yearbooks for 1947 through 1952, and in California Division of Mines Bulletin 144 (Heyl, Cox, and Eric, 1948, p. 65), the Penn mine alone has been the source of 1,225,798 pounds of lead.

Most of the lead produced in the county has been a by-product of copper-zinc mining in the Foothill belt (see copper-zinc section). The Penn and the Quail Hill mines have been the chief producers. Smaller amounts have been recovered as a by-product of gold mining.

Galena (PbS) is the principal lead ore mineral. In the Foothill copper-zinc ores it is closely associated with pyrite, chalcopyrite, pyrrhotite, and sphalerite. Galena is a minor constitutent of Mother Lode gold ores. In some East Belt gold ores, especially those of the West Point district, it is present in quantity and is associated with free gold, pyrite, and chalcopyrite.

Limestone

The quarrying of limestone and the manufacture of cement by the Calaveras Cement Company is the most lucrative segment of the mineral industry in Calaveras County. Not only has this industry accounted for the largest portion of the mineral output of the county for a number of years, but the extensive limestone and dolomite deposits form some of the largest undeveloped reserves in the state. Not only is limestone the principal constituent of portland cement, but large quantities are used in the manufacture of lime and beet sugar, as metallurgical flux, and in the agricultural and chemical industries. As the population and industrial capacity of California have increased, the consumption of these materials likewise has increased. Since World War II, the annual output of the Calaveras Cement Company has tripled.

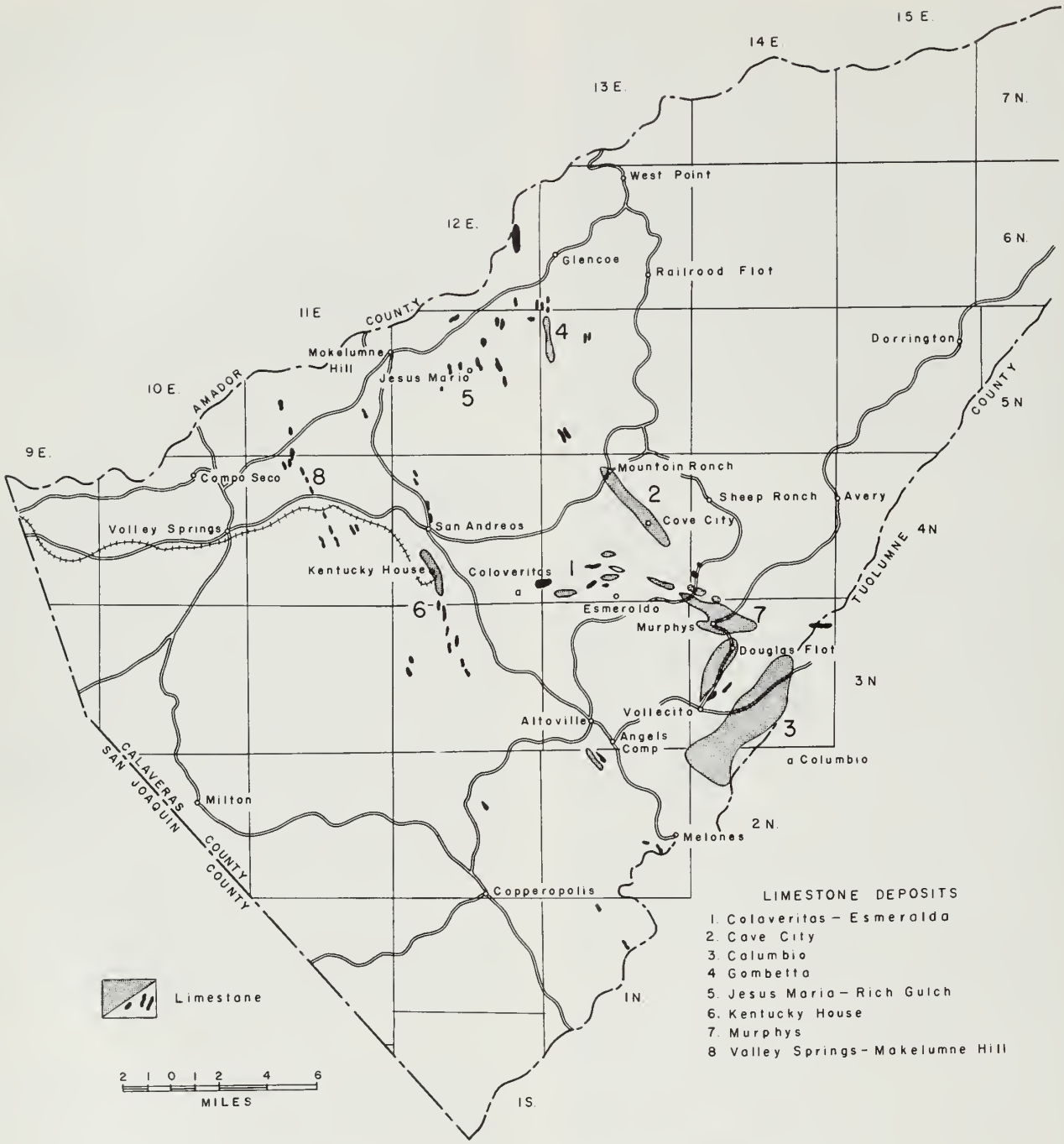


Figure 13. Map of Calaveras County showing distribution of limestone deposits.

Limestone deposits are widely distributed in Calaveras County. The term "limestone" in this report is used in a broad sense to include carbonate rocks ranging in mineral composition from nearly pure calcite to nearly pure dolomite. The largest deposits in the county are: the northern extension of the Sonora-Columbia limestone belt, the Murphys, Cave City, Kentucky House, and Gambetta deposits. Other deposits are present in the Calaveritas-Esmeralda area, in the vicinity of Jesus Maria, northwest of Mountain Ranch, north and east of Murphys, southeast of Kentucky House, west of Glencoe, west of Carson Hill, north of San Andreas, and between Mokelumne Hill and Valley Springs. Except for the deposit at Kentucky House, the large limestone masses are east of the Mother Lode belt.

Most of the known limestone deposits in the county are shown in figure 13.

Most Sierra Nevada limestone deposits are lenticular masses of recrystallized limestone and dolomite that are interbedded with metasedimentary and metavolcanic rocks of the Calaveras formation. Many have been intruded by granitic rocks. They range from small lenses

less than 1000 feet in length and not more than a few scores of feet in thickness to those that are square miles in extent. The limestones range from white to various shades of bluish-gray. The high-calcium limestone is in irregular masses intermingled with dolomite rock, commonly at or near the margins of such deposits. However, some deposits, especially those west of the Mother Lode (and a few to the east), are composed principally of high-calcium limestone with little or no dolomite.

Those deposits that lie east of the Mother Lode are medium to coarsely crystalline, while those to the west mostly are fine-grained. Although the west-belt deposits are smaller, they are more uniform in composition and commonly are superior for some uses to those to the east (Bowen, 1957, p. 296). The number of west-belt deposits is large—a total of 26 is shown on the Jackson folio (Turner, 1894). Schist, greenstone, slate, and chert are commonly interbedded with the limestone, and in some deposits selective quarrying is necessary. Many of the limestone deposits are cut by dikes of fine- to- medium-grained diorite and quartz diorite.

Solution caves and potholes are abundant in some of the deposits; Mercer's and Moaning Caves are noted tourist attractions (see section on Caves). Some of the potholes contained rich placer gold deposits that were mined during the gold rush. Veins and seams of secondary aragonite and coarse calcite along joint planes are common. A few fossils ranging from Mississippian to Permian in age have been found in some of the limestone bodies in the Sierra, but fossil evidence is sparsely distributed.

Except for those deposits developed by the operations of the Calaveras Cement Company (the Kentucky House deposits and the deposit east of Calaveritas containing Quarry No. 4), and a few small west-belt deposits quarried years ago for smelter flux, all others are undeveloped. Little is known of their chemistry, and few if any chemical analyses are available for many of the deposits. Many are shown on the folios of the U. S. Geological Survey made years ago. However, subsequent geologic mapping by Clark (Clark, 1954) and by members of the staff of Calaveras Cement Company have shown that some of the deposits are considerably larger than originally shown in the folios. This is especially true in the cases of the Gambetta and Cave City deposits. In addition, some deposits are not shown on the folios. Many are relatively inaccessible at present, but as California's demand for limestone, dolomite, and lime products increases, the Calaveras County deposits will increase in importance as potential sources of raw material.

Numerous deposits of marble are found in Calaveras County, three of which have yielded small amounts of stone for decorative facings and terrazzo (see section on Stone). The Caldwell, Hertzig, and Treat deposits near San Andreas, were prospected prior to 1906, but no production was reported. The Angels and Eagle deposits southeast of Vallecito were active prior to 1915; three small shipments are recorded. The Sundborg property near Vallecito has yielded yellow marble for terrazzo chips since 1946.

Photo 35. Stalactites and stalagmites in a Calaveras County cave. *Photo by Leigh Readdy.*

Caves

A number of limestone caves are found in Calaveras County. They range in size from small openings only a few feet in extent to those caverns hundreds of feet in length and depth, that contain numerous passageways, extensive rooms, and beautiful dripstone formations. Some caves are not well known, but others, such as Mercer's and Moaning Caves, are visited by many persons each year. Much of the following information was provided by Leigh Readdy of the National Speleological Society.

Moaning Cave, 1½ miles south of Vallecito, is a vertical cave containing a large room 150 feet in diameter and at least 100 feet in depth where many dripstone formations can be seen. It is well lighted and is entered through a 100-foot enclosed spiral staircase. A number of Indian bones were discovered here recently by members of the National Speleological Society.

Natural Bridge, 1 mile to the south on Coyote Creek, is a remnant of a cave. Gold Tooth Cave, southeast of Moaning Cave near the Camp Nine road, is limited in extent. Years ago a skull with a gold tooth was found here.

Mercer Cave, 1 mile northwest of Murphys, has a vertical entrance and a number of horizontal passageways. It is well lighted with good walkways. Many beautiful dripstone formations are exposed and one area in the cavern displays outstanding aragonite crystals.

Several caves are located near the site of the old mining town of Cave City. Cave City Cave, which was commercialized during the period 1850-70, is more than 1000 feet in extent. It has at least four separate entrances. There are several large rooms with underground lakes. Another cave in the vicinity of Cave City is Skull Cave, which is more than 100 feet deep. Many skulls were found here during the early days of the gold rush. It was believed to have been used by Indians as a burial place during smallpox and cholera epidemics.

Photo 36. Calaveras Cement Company's Quarry No. 4 as viewed from the east. The light-colored, well-jointed rock is limestone. *Photo courtesy Calaveras Cement Company.*

Calaveras Cement Company

Location: Plant and local offices are in sec. 29, T. 4 N., R. 12 E., M.D.M., at Kentucky House 2½ miles south of San Andreas; Quarry No. 1 is north of the plant; Quarry No. 2 is east of the plant; and Quarry No. 4 is in secs. 25 and 35, T. 4 N., R 12 E., and sec. 30, T. 4 N., R. 13 E., M.D.M., north of Calaveritas Creek and 6 miles east of the plant.

Management: Calaveras Cement Company, 315 Montgomery Street, San Francisco, California. William Wallace Mein, Founder and Chairman of the Board; William Wallace Mein Jr., President; Gardner W. Mein, Assistant to the President, and Assistant Secretary; Grant Metzger, Vice President, Operations; M. J. London, Vice President, Marketing; Arnold Ross, Vice President, Finance; J. Tedesco, Secretary-Treasurer; E. J. Norris Jr., Controller; O. E. Duling, Chief Engineer. At the plant: Orrin Weeks, Manager; M. C. Sutton, Chief Chemist; Evan Hall, Plant Superintendent.

The Calaveras Cement Company is one of the major producers of cement in northern California. Six types of cement are manufactured, which are used in nearly all types of construction. Since the plant was erected, it has been enlarged greatly. In 1959 it had a rated capacity of more than 4½ million barrels per year.

In 1922, William Wallace Mein became interested in the limestone deposits of Kentucky House area as a possible source of raw material for a cement plant. After an extensive sampling program, money was secured, and construction of the plant began. The Southern Pacific Railroad's Valley Springs branch line was extended to Kentucky House to serve the new plant. In January 1925 the Calaveras Cement Company was incorporated, and in May 1926 the plant was formally opened (Ross, 1950, p. 18). Except for a short period during the depression in the early 1930s, the plant has been in continuous operation since it was constructed. Large quantities of Calaveras Cement have been used in the construction of the Pardee Dam, the San Francisco-Oakland Bay Bridge, Friant Dam, military bases during and since World War II, the Delta-Mendota canal, Folsom Dam, Pine Flat Dam, and numerous freeways and superhighways.

The rated capacity of the plant originally was 1,200,000 barrels per year (Logan, 1936, p. 233). The two 240-foot kilns were the original kilns at the plant. Limestone from Quarries Nos. 1 and 2 just north and east of the plant were delivered in 18-ton railroad cars hauled by gasoline locomotives. In 1935, truck haulage from the newly opened Quarry No. 4, 6 miles east of the plant, began. During 1940-41, a 40-mile, 8-inch pipeline was constructed from the Rio Vista gas field in the San Joaquin-Sacramento River delta region to provide a direct source of fuel for the kilns. During World War II the company began to ship cement in bulk form.

An extensive program of plant and quarry expansion began in 1945. A 360-foot kiln, half again as long as the two original kilns, was erected in 1946, which doubled burning capacity. New milling and quarrying equipment were obtained also. In 1952 a fourth kiln, also [illegible] in length, was added. As a part of the same program, additional ball mills, a dust collector, a cooling unit, and blending and storage silos were installed. A new rotary drill, one of the first of its type to be used in California, was purchased. These improvements increased the rated plant capacity to 10,000 barrels per day.

Another modernization program was initiated during 1955-56. A fifth kiln (which began operating in the summer of 1956), new blending facilities for both raw feed and finished material, an additional rotary drill for the quarries, eight new 110-foot storage silos, and new crushing units were installed, which increased the rated plant capacity by another 30 percent. New offices, shops, and warehouses were built. In 1956, Quarry No. 1 which had been idle since 1945, was reopened.

Six kinds of cement are customarily manufactured and marketed by the Calaveras Cement Company. Type I portland cement is used in general construction. Type II portland cement, a moderate heat- and sulfate-resisting cement, is used in heavy construction such as dams and canals. Calaveras Early Hardening cement, Type III, is used where early strength and reduction of overall construction time are desired. Also manufactured are Calaveras White, a white non-staining portland cement; Calaveras Plastic, which is used in stucco and plastering; and Calaveras Pipe cement. Types IV and V are occasionally made on special order; the raw materials are such that any type of cement can be made if required. Much of the Type I and II cements are made to low-alkali specifications.

Quarry No. 1, the chief source of raw material for the plant during the early years of operation, was reopened in 1956. At the present time, it is the source of a substantial portion of the crude limestone used at the plant. This quarry is in the largest and northernmost lens of the Kentucky House limestone deposits (see fig. 13). The deposit consists essentially of two major lenses of high-calcium limestone lying on the west side of an extensive body of dolomite. The largest of the two high-calcium limestone lenses is 2000 feet long, as much as 500 feet thick, and trends N. 30° W. The smaller high-calcium lens, which lies to the southwest, is 1000 feet long and 400 feet thick on the maximum. It trends N. 45° W; the two lenses converge toward each other in a southeasterly direction. Lying between the two main lenses are a number of small, narrow, high-calcium limestone beds. East of and interbedded with the high-calcium limestone are beds of sheared hydrothermally altered dolomite which locally contains magnesite. Also present are amphibolite and chlorite schists. Quartz-diorite dikes cut the limestone and adjoining metasedimentary rocks. The Mother Lode zone of thrust faulting is just east of the deposit. West of the limestone deposit are interbedded slate, phyllite, and greenstone.

Generally, the high-calcium limestone is fine-grained, medium to dark bluish gray in color, and often stylolitic. Locally, however, there are considerable amounts of coarse-grained limestone or mixed coarse- and fine-

Phata 37. Sauth face af Calaveras Cement Campany's Quarry Na. 1. Shawn in the foreground is a drap ball used ta break large fragments. Camera facing east.

grained limestone with schistose partings, many of which contain abundant graphitic material. The limestone is fetid to a mild degree. There are a few veins of extremely coarse-grained white calcite. Usually varying amounts of fine-grained pyrite are present as "fish-scale" in fractures or in disseminated grains in the dikes that cut the limestone. The limestone schistosity has an average strike of N. 30° W. and a dip of 75° or more to the northeast. The best grade of limestone contains as much as 98 percent $CaCO_3$.

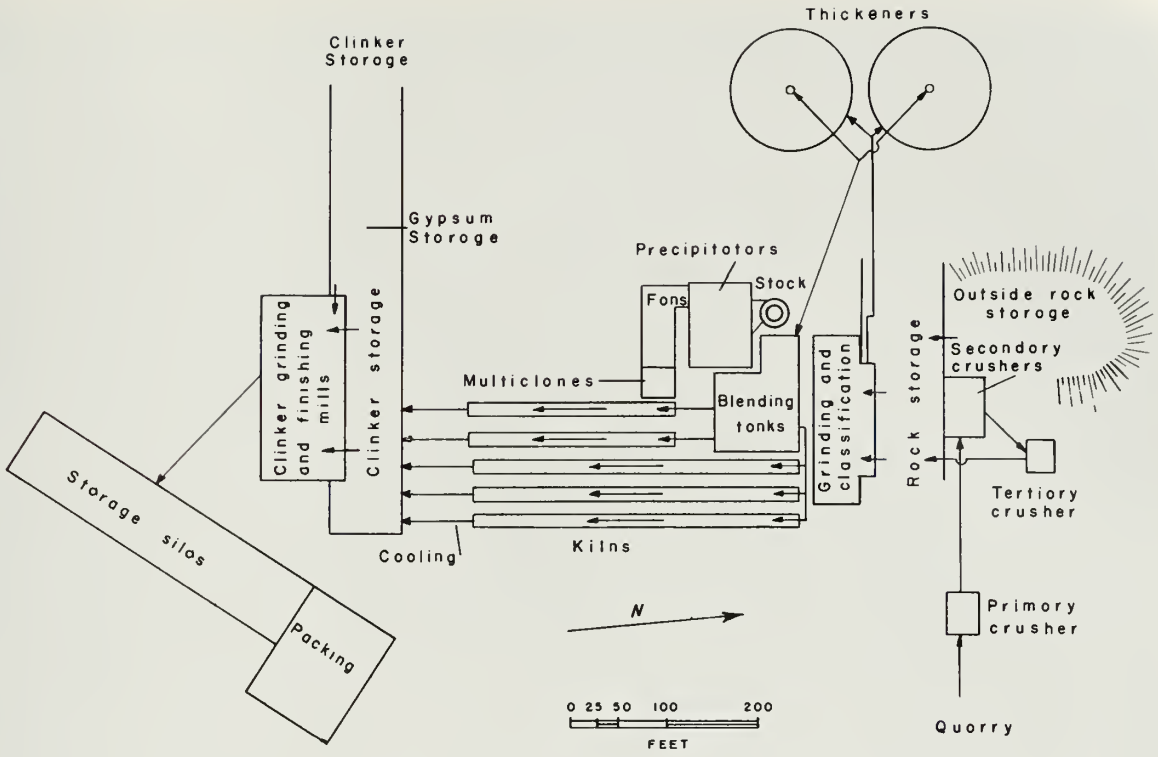
Quarry No. 4 was the principal source of raw material for the plant from 1945 to 1957. This quarry is in the largest of a series of parallel limestone lenses that lie east of the Mother Lode belt in the Calaveritas area (see fig. 13). These lenses are part of a west-extending tongue of Calaveras metasediments, which lies between granodiorite on the north and green schist on the south. Country rock in the immediate vicinity of the limestone is quartz-mica schist containing small interbeds of chlorite and hornblende schist and massive quartz-amphibolite rock. In its largest dimension this deposit is 1200 feet long and 800 feet wide. Clark has divided this lens into three blocks which are separated by two high-angle west-trending faults (Clark, 1954, p. 18). However, later work has led the company staff to believe the shape of the limestone body is due in large part to complex folding and plastic flowage of the limestone, and that the faults are less important in determining the shape of the deposit. The lineation is the most prominent and consistent structural feature, trending almost due east and pitching 35° E.

The limestone is massive and coarsely crystalline, and ranges from white to gray in color. In several places it is cut by fine-grained diorite and quartz-diorite dikes. In most places the limestone is high in calcium and low in magnesium. The following chemical analyses were made in the company laboratory on diamond drill cores across 164 feet of the central part of the lens:

Sample no.	SiO_2	Fe_2O_3	Al_2O_3	$CaCO_3$	$MgCO_3$
1	.20	.09	.18	98.90	.69
2	.69	.13	.27	98.49	.44
3	.56	.09	.30	98.33	.73
4	3.53	.27	.41	94.96	.81
5	1.61	.45	.67	96.19	1.10

The nearby country rock, which commonly is referred to as "shale," is mined for the necessary silica, alumina, and ferric oxide required in cement making. As there are a number of small interbeds of schist in the limestone which ordinarily supply these oxides, only about 10 to 12 percent of this "shale" is mined separately.

At both quarries the limestone is mined in 50-foot benches. The schist overburden at Quarry No. 4 is mined in irregular benches (see photo 36). For primary blasting, vertical holes 55 to 80 feet in depth, depending upon the desired bench height, are drilled to 5 feet below bench grade. Bucyrus-Erie crawler-mounted rotary drills equipped with Hughes bits are used at each quarry. At Quarry No. 1 a model No. 40-R with a 9-inch bit, and at Quarry No. 4 a model 50-R with a 9⅞-inch bit, are used. Air is blown through ports in the centers of the bits. For hard waste material carbide-tipped bits are used. Blasting is largely done with ammonium nitrate. Holes are primed with Hercules 60 percent "Gelanite," the priming charge amounting to 5 percent of the total load, and detonated electrically. In wet conditions, the priming charge occasionally will be as high as 20 percent. Usually from 50,000 to 100,000 tons of rock are dislodged in one blast.



Modified after map drawn by John W. Jones, November, 1956. Courtesy Coloveros Cement Company.

Figure 14. Simplified map and flowsheet of Calaveras Cement Company plant.

Secondary blasting of large fragments is done with "Gelamite" and secondary breaking with Loraine "Motorcranes" equipped with 5000-pound drop balls. A Gardner-Denver "Air Trac" portable drill, which drills 3-inch holes, is used in toe holes as well as in trimming and in the preparation of approaches. At Quarry No. 1 there are two Bucyrus-Erie electric shovels, one with a 2½-yard and the other with a 5-yard dipper. At Quarry No. 4 there are also two Bucyrus-Erie electric shovels one with a 3½-yard and the other with a 2-yard dipper. A Michigan 6-yard payloader is used for cleanups and stockpiling. From Quarry No. 1 limestone is trucked a third of a mile to the plant; from Quarry No. 4 it is trucked approximately 6 miles. The truck fleet used for hauling crude limestone to the plant consists of fourteen Euclid 25-ton and three Kenworth 25-ton end-dump trucks.

At the plant the trucks from the quarries dump the limestone directly into a primary Allis-Chalmers McCulley 48-inch gyratory crusher set at 4½ inches (see fig. 14 for generalized plant flowsheet). Crushed material is belt-conveyed to a surge bin and then to the secondary crushing unit, which consists of three Telsmith 48-inch cone crushers. From this point the material goes to the tertiary crushing unit consisting of three Symons 5½-foot shorthead cone crushers, where the rock is reduced to minus ½-inch size. The material is then discharged into raw storage and arranged in stockpiles by a traveling overhead crane with a clamshell bucket. From storage the crane delivers the crushed limestone and shale into the raw mill feedbins in specified proportions.

At the raw mill, there are two grinding-classifying circuits, each consisting of a 9- by 9-foot Marcy ball mill in closed circuit with a rake classifier and a 9- by 25-foot Marcy ball mill in closed circuit with two 20-inch Krebs cyclone classifiers. Overflow from the rake classifier goes to one cyclone, underflow from both cyclones passes to the 9- by 25-foot ball mill, and overflow from both cyclones flows to the thickeners. A slurry ranging from 88 to 90 percent minus 200-mesh in particle size and containing from 60 to 65 percent water is produced.

There are two 150-foot Dorr thickeners where the water content of the slurry is reduced to 35-40 percent. The thickened slurry is pumped to one of 15 slurry tanks or blending silos where it is agitated by compressed air and blended until the desired proportions are attained. The finished slurry is stored in kiln feed tanks. A typical slurry analysis in percentages by weight is as follows:

SiO_2	Fe_2O_3	Al_2O_3	$CaCO_3$	$MgCO_3$	NaO-K_2O
14.87	2.05	3.23	77.69	1.77	0.39

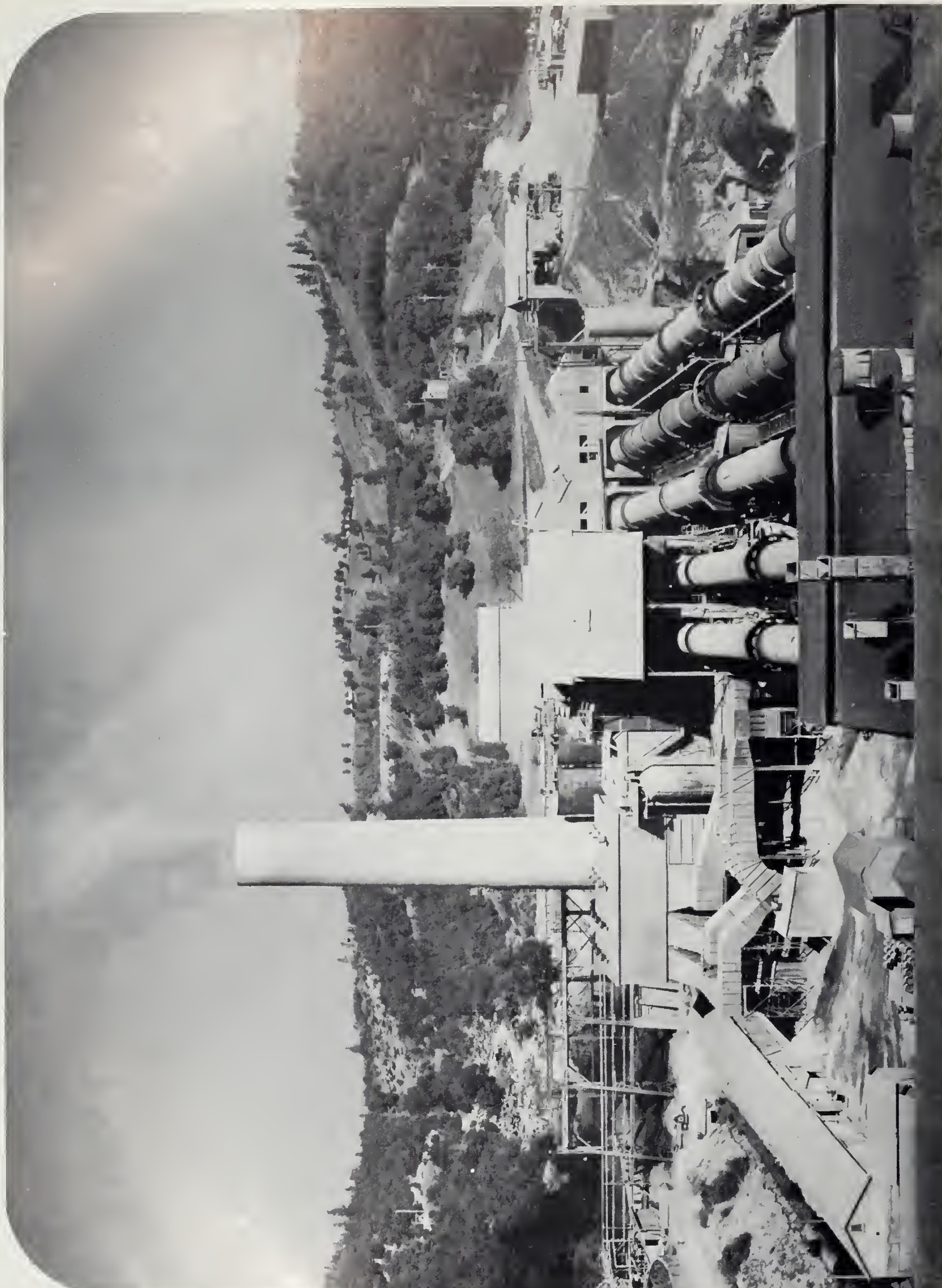


Photo 38. Calaveras Cement Company plant; kilns are in the right foreground, crushing plant in the right background, precipitators in the left foreground, rock storage shed in the left background, and thickener at the extreme left. Camera facing north. *Photo courtesy Calaveras Cement Company.*

Photo 39. Coloveros Cement Compony plant rock storoge shed: clomshell bucket, limestone and "shale" stockpiles, ond blending bins. *Photo courtesy Calaveros Cement Company.*

The finished slurry is then fed to the kilns. Kilns A and B, which were the orginial burning plant, are 240 feet long, with a burning zone 11 feet 3 inches in diameter; the rest of the kiln is 10 feet in diameter. Kilns C, D, and E are 360 feet long and 11 feet 3 inches in diameter throughout. The kilns are fired with natural gas, but there is a standby fuel oil system. Clinker from the kilns that ranges from dust- to baseball-sized particles goes to air-quenched coolers, which reduce the temperature from 3400°F. to less than 300°F. A typical clinker analysis in percentages by weight is as follows:

SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	NaO-K_2O
22.90	3.16	4.97	67.07	1.30	0.60

Dust from the kilns is collected by Cottrell precipitators and returned to the kiln feed system.

Cooled clinker is first ground in three preliminary 7- by 8-foot Marcy ball mills and one 9- by 12-foot Marcy rod mill. It then goes to the finishing mills which consist of five Allis Chalmers 8- by 26-foot ball mills and a Marcy 9- by 25-foot ball mill. Three to 5 percent by weight of minus ¾-inch gypsum is added to the finishing mills. The finished cement is delivered by screw conveyors, air slides, and elevators to 20 storage silos which have a combined storage capacity of 450,000 barrels. Bagging is done at the plant packhouse just prior to loading as needed. Close chemical control is maintained in all phases of plant operation, and analyses and physical tests are made continuously in a modern well-equipped laboratory.

Northern California is the principal marketing area for Calaveras Cement Company products, but considerable amounts are sold in southern Oregon and western Nevada. The majority of the finished cement is marketed in bulk form. Bulk cement is delivered in hopper-bottom trucks or special covered railroad hopper cars.

At the plant there are machine, carpenter, electrical, and blacksmith shops, and a garage for the maintenance of equipment. More than 400 persons are employed at the quarry and plant.

Calaveritas-Esmeralda deposits

There are a number of west-trending limestone lenses in the general area of the old mining towns of Calaveritas and Esmeralda (see fig. 13). A total of seventeen is shown on Clark's map (Clark, 1954, plates 1 and 2). These lenses are interbedded with a series of west-striking beds of metasedimentary rocks of the Calaveras formation. Granodiorite lies to the west and green schist to the south. The only deposit of this group that is commercially mined is the large westernmost lens in which Calaveras Cement Company's Quarry no. 4 is located (see Calaveras Cement Company in this chapter). Another extensive lens, which is about 3900 feet long and 600 feet wide, lies just to the east. Most of the other lenses are limited in size. Generally the larger lenses in this area contain high-calcium limestone, and the smaller ones are largely dolomitic (Willard Fuller, personal communication, 1958).

Cave City deposit

This large deposit is in the central portion of the county approximately 9 miles east of San Andreas and extends southeast from the town of Mountain Ranch. Because of its remote location and mixed calcite-dolomite character, it has not been commercially mined. Some years ago the Calaveras Cement Company obtained an interest in a portion of the deposit in the Adobe Creek area 1 mile southeast of Mountain Ranch. In 1950-51 this concern conducted a sampling program, but since has disposed of its interests in the area (Calaveras Cement Company, personal communication, 1959).

The deposit is shown on the Jackson folio as being slightly more than 2 miles long and as much as 1500 feet thick (Turner, 1894). However, subsequent work by the Calaveras Cement Company and Clark (Clark, 1954, plate I) has shown the deposit to be at least 4 miles long and to range from 600 to 1500 feet in thickness. It is lensoid in shape, the lens striking N. 45° W. and dipping 60°-75° NE. Country rock is graphitic schist and impure quartzite of the Calaveras formation. Small amounts of schist are interbedded with the limestone. In places the limestone is overlain by fairly extensive deposits of Tertiary auriferous gravel which were mined during the gold rush. Cave City was an important gold-mining center.

The limestone ranges from white to bluish-gray in color. Much of the rock has been thoroughly brecciated and then recemented. The low-magnesian limestone is coarse-grained, and the dolomite and dolomitic limestone are fine grained. The most prominent outcrops of this deposit usually are dolomitic (Clark, 1954, p. 7). The sampling done by the Calaveras Cement Company has shown that at least in that portion of the deposit near Adobe Gulch, the dolomite is in the central and footwall part of the lens, and the low-magnesian limestone is near the hanging wall. The following two tables are the results of the sampling done of the deposit, and were supplied by the Calaveras Cement Company. Samples were taken across the lens in six sections, the sections being approximately a fifth of a mile apart. Section A is slightly less than 1 mile southeast of Mountain Ranch. The first table contains overall averages of the entire section sampled, and the second table is of the hanging wall portion.

Analyses of Cave City limestone deposit in Adobe Gulch area.

Section	*Width*	SiO_2	R_2O_3	$CaCO_3$	$MgCO_3$
A	597 ft.	0.91%	0.26%	81.71%	17.72%
B	300	0.27	0.38	75.88	23.59
C	551	0.37	0.72	80.79	18.27
D	951	0.31	0.34	82.34	16.60
E	1042	0.46	0.62	81.75	14.20
F	1239	0.83	0.54	86.03	10.49

Analyses of hanging wall portion of Cave City limestone deposit in Adobe Gulch area.

A	95	0.15	0.14	80.44	18.94
B	100	0.11	0.20	93.75	6.73
C	121	0.36	0.45	94.02	5.99
D	111	0.21	0.25	96.96	3.30
E	94	0.32	0.12	91.98	8.41
F	300	0.31	0.40	95.48	3.85

Columbia deposits

The Columbia deposits form the north extension of the great Sonora-Columbia limestone belt, the largest in the Sierra Nevada. In Calaveras County this belt is in the vicinity of Douglas Flat and Vallecito and covers at least 10 square miles (see fig. 13), while another 5 square miles of limestone probably is overlain by Tertiary gravel and volcanic detritus. Except for minor quarrying for marble and road rock, the Calaveras County portion of the deposit has not been mined commercially.

Because of the complex geologic structures in the area, the shape of the deposit is extremely irregular. South of Vallecito by the Calaveras-Tuolumne County line, the limestone has been intruded by a body of granodiorite. Here the limestone dips to the south toward the granodiorite body. In the remainder of the deposit, the limestone strikes west-northwest and dips steeply to the northeast. Granodiorite also lies north of the west portion of the deposit, but the remainder of the country rock surrounding the limestone is schist, quartzite, and slate. Present in the limestone are interbeds of schist and a number of diorite and quartz-diorite dikes.

As yet, much of the Columbia limestone has not been mapped in detail or systematically sampled. Although large portions of it consist of dolomite and magnesian limestone, there are extensive areas within the deposit that are known to be composed chiefly of high-calcium limestone. Two such areas within this deposit are between Cataract Gulch and Wool Hollow, 4 miles northeast of Vallecito and near the junction of Skunk Gulch and the Stanislaus River, 3 miles southeast of Vallecito.

The Calaveras Cement Company has carried out an extensive sampling and diamond drilling program in the Cataract Gulch area. This work has indicated that the deposit is large but irregular in outline and grade and that it is cut by numerous dikes ranging from a few inches to as much as 30 feet in thickness (Calaveras Cement Company, personal communication, 1958). The following analyses, which have been supplied by the company, were made from a drill hole 1,352 feet in length. Its overall average is shown under A; the high-calcium portions are segregated under B; and the average of the remaining dikes and high-magnesian portions is shown in C:

Analysis of Columbia limestone drill-hole sample from Cataract Gulch area.

	Percent		
	A	*B*	*C*
SiO_2	4.71	3.45	10.19
R_2O_3	2.98	2.36	5.65
$CaCO_3$	86.18	91.74	61.91
$MgCO_3$	5.88	2.35	21.24

The other known high-calcium deposit in vicinity of Skunk Hollow covers an area of about 100 acres and has been estimated by C. J. Loomis of San Andreas to contain reserves of at least 50 million tons. It is coarsely crystalline and white or white with grayish streaks. The following analysis of a sample from this deposit was supplied by Mr. Loomis:

Analysis of Columbia limestone sample from Skunk Hollow area.

	Percent
SiO_2	0.41
Fe_2O_3	0.036
Al_2O_3	0.23
$CaCO_3$	98.32
$MgCO_3$	0.72

Gambetta deposit

Location: Sec. 36, T. 6 N., R. 12 E., sec. 31, T. 6 N., R. 13 E., sec. 1, T. 5 N., R. 12 E., and secs. 6, 7, and 18, T. 5 N., R. 13 E., M.D.M., 4 miles west-southwest of Railroad Flat in the vicinity of the junction of Esperanza Creek with the North Fork of the Calaveras River. Ownership: Calaveras Cement Company, 315 Montgomery Street, San Francisco, California.

This is one of the larger undeveloped limestone deposits in the county. It was purchased by the present owner about 30 years ago. Since then it has been mapped in detail, and some diamond drilling has been done.

The deposit consists of a number of discontinuous and parallel north- to northwest-trending east-dipping lenses that crop out for a distance of approximately 2½ miles along the strike. However, the bulk of the deposit is confined to one large lens that is nearly 2 miles long and ranges from 100 to as much as 1000 feet in thickness. The limestone is white to bluish-gray in color and ranges from a high-calcium variety to dolomite in composition. Some silica is present. The high-calcium limestone is coarse-grained, but the high-magnesium limestone and dolomites are fine-grained. Country rock is slate, metachert, and schist of the Calaveras formation.

In the central portion of the main lens the footwall is dolomite and magnesian limestone and the hanging wall is high-calcium limestone. This high-calcium horizon is at least 2500 feet long and averages 500 feet in thickness for more than half its length. Another extensive high-calcium portion of this deposit is in the northwest portion where a lens is 2500 feet long and 200 to 300 feet thick. The following is an analysis made by the Calaveras Cement Company of a sample taken from the north end of the deposit:

SiO_2	*Fe_2O_3*	*Al_2O_3*	*CaO*	*MgO*	*P_2O_5*
4.70	0.48	1.21	50.49	1.42	0.13

Jesus Maria-Rich Gulch deposits

There are a number of limestone lenses in the Jesus Maria-Rich Gulch area of north-central Calaveras County (see fig. 13). Twelve are shown on the Jackson folio (Turner, 1894, plate 3). The Gambetta deposit, which is described separately in this chapter, is the largest in the area. The other deposits range from a few hundred to several thousand feet in length. Little is known of their composition, but those that crop out along the road west of Jesus Maria are composed largely of white to bluish-gray dolomite and are cut by numerous quartz veins and diorite dikes.

Kentucky House deposits

A series of north- to northwest-striking limestone lenses extends from approximately 1 mile north of the Calaveras Cement Company plant at Kentucky House southward for a distance of about 4 miles. The lenses consist of dolomite and various amounts of high-calcium limestone. The most extensive deposit is the northernmost lens, which contains Calaveras Cement Company's Quarry no. 1 (see Calaveras Cement Company in this chapter). According to plate 3 of the Jackson folio (Turner, 1894), this deposit is 1½ miles long and nearly 1400 feet thick. It contains several en echelon lenses of high-calcium limestone ranging from one-half to three-quarters of a mile in length and 300 to 500 feet in thickness. The dolomite, which includes some crystalline magnesite, contains 40 percent or more magnesium carbonate. There are at least five other lenses to the south that range from less than 1000 to more than 2000 feet in length and are as much as 500 feet in thickness.

Murphys deposit

The extensive Murphys deposit lies northwest, north, and east of Murphys and is just north of the Columbia limestone belt. According to the Big Trees folio (Turner and Ransome, 1898), the main limestone body is an irregular northwest-trending lens approximately 4 miles long, which ranges from 1000 feet to more than a mile in width. Several smaller lenses lie to the north.

It is similar in character to the Columbia limestone. Country rock is graphitic mica schist, and there is schist in portions of the limestone. It is also cut by diorite dikes, and at the Oro y Plata gold mine, there are sulfide-bearing gold-quartz veins in the limestone. Mercer's Cave, a noted tourist attraction, is in this deposit. This deposit has not yet been mapped in detail, and the high-calcium portions have not yet been delineated.

The following are analyses made by Abbott Hanks Company of San Francisco of limestone samples taken just west of Mercer's Cave:

Sample no.	SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	P_2O_5
MU-1	.23	.05	.14	52.59	2.59	trace
MU-2	.17	.11	.10	49.87	4.93	.01
MU-3	.27	.02	.21	53.87	1.40	.03
MU-4	.23	.07	.25	54.64	2.28	trace
MU-5	.11	.07	.12	54.02	1.25	.01
MU-6	.32	.09	.28	53.57	1.61	trace

The following analyses are of samples taken at the south edge of the town of Murphys.

Sample no.	SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	P_2O_5
MU-7	.73	.07	.13	54.88	.38	trace
MU-8	1.09	.18	.40	54.45	.41	.01
MU-9	1.61	.16	.64	53.53	.69	.07
MU-10	.46	.09	.20	54.70	.57	.01
MU-11	.28	.07	.15	55.07	.42	.01
MU-12	.31	.07	.45	54.73	.53	.01

Valley Springs-Mokelumne Hill deposits

There are a number of west-belt limestone deposits in northwestern Calaveras County between Valley Springs and Mokelumne Hill (see fig. 13). These include the Gale Ranch, Le Clerq, Markwood, McNamara, Penn, Watt and Field, and Young deposits which were described briefly by Logan in 1947 (Logan, 1947, pp. 217-218). All have been idle for many years, but at one time lime was manufactured in stone limekilns at several of the deposits. Later several were mined for fluxing material, which was used at the Penn copper smelter at Campo Seco. The principal sources of smelter flux were the Penn deposit, which was reported to have yielded 15,000 tons, and the McNamara deposit which yielded 3,000 tons (Logan, 1947, p. 218).

These deposits are northwest-striking lenses, most of them averaging several thousand feet in length and several hundred feet in thickness. They are in a northwest-trending belt of slate and schist of the Calaveras formation. The limestone is fine-grained and white to light bluish gray in color. Few chemical analyses are available although two samples taken by C. A. Logan in 1943 were reported as follows (Logan, 1947, p. 218):

Analysis of limestone from McNamara, and Watt and Field deposits.

McNamara deposit	Percent
Insoluble	2.99
Ferric and aluminic oxides	1.21
Calcium carbonate	89.90
Magnesium carbonate	5.63
Watt and Field deposit	
Insoluble	2.23
Ferric and aluminic oxides	1.29
Calcium carbonate	93.10
Magnesium carbonate	3.02

Manganese

The total recorded output of manganese ore in Calaveras County is 32 short tons, which was mined during the period 1942-46 (Trask et al., 1950, p. 10). There are 17 known prospects and deposits in the county. All are small, and most of them have not been productive. Detailed descriptions of the manganese deposits and prospects in Calaveras County appear in California Division of Mines Bulletin 152 (Trask et al., 1950, pp. 38-47). A short description also appears in the tabulated list at the end of this report.

Primary manganese minerals in Calaveras County, consisting of rhodonite, spessartite, and rhodochrosite, mostly are weathered to black manganese oxides (pyrolusite and psilomelane). The ore bodies consist of mixtures of black oxides and primary minerals in veinlets and disseminations in schist and recrystallized chert of the Calaveras formation; some are in chert and metavolcanic rocks of the Amador group. Nearly all of the deposits in Calaveras County are limited in extent, and the ore bodies rarely extend to depths of more than a few feet.

Mineral Paint

From 1894 to 1913 a total of 1,876 tons of mineral paint valued at $13,958 was produced in Calaveras County. There was some output in 1915 and 1917, but figures are not available. Most of the mineral paint was obtained from the Valley Springs - Campo Seco area,

where yellow to dark-red ochre is found in northwest-striking beds of decomposed slate and schist. Apparently the chief source was the Late ochre mine half a mile west of Valley Springs (Aubury, 1906, p. 338).

Molybdenum

In 1957 some molybdenum concentrates were produced at the Moore Creek tungsten mine in the Garnet Hill area in northeastern Calaveras County. The concentrates were recovered by selective flotation (see Moore Creek mine in chapter on tungsten). At this property, appreciable quantities of molybdenite (MoS_2) and minor amounts of powellite ($CaMoO_4$) are associated with scheelite and copper sulfides in tactite. The molybdenite commonly is in coarse flakes and foliated masses an inch or more across. It also is found in disseminated form in some of the granitic rocks adjacent to the tactite.

Smaller amounts of molybdenite are found in tungsten ores at the Garnet Hill mine, but there has been no commercial production from this property. Molybdenite was fairly common in parts of the Bull vein at the Carson Hill gold mines (Knopf, 1929, p. 76), and it was found in sulfide-rich gold ore at the Hale mine near Angels Camp (Murdoch and Webb, 1956, p. 230).

Nickel *

There is no recorded production of nickel from Calaveras County. However, because nickel is genetically associated with ultrabasic igneous rocks, possible nickel-bearing areas in Calaveras County are well defined. The principal ultrabasic rocks, peridotite, dunite, and pyroxenite, as well as serpentine derived by alteration of these types, contain noteworthy trace amounts of this element, in most places about 0.2 percent nickel. Large bodies of serpentine in Calaveras County are situated near Valley Springs and Copperopolis (see figs. 15, 16).

Serpentine, a rock composed principally of magnesia, silica, and iron oxide, most commonly is a sheared, pale bluish-green rock that weathers to a brownish-red color. Asbestos and disseminated chromite and magnetite frequently are in it.

Weathering of exposed surfaces of serpentine during early Tertiary time produced a deep lateritic soil, a residual soil from which silica and magnesia have been leached, and in which hydrous iron oxides and aluminum hydroxides have been concentrated. In many Sierran areas laterities were developed on surfaces of low relief, and much of the leached silica and magnesia were redeposited at shallow depths as chalcedony, jasperoid, opal, and magnesite. Part of this silicified mantle has been removed by erosion, and part has been obscured by younger volcanic rocks.

The laterite in the Sierran foothills is of interest because it is similar in origin to lateritic nickel deposits throughout the world, including those that are worked commercially.

* Based on a preliminary investigation of nickeliferous laterite in the Sierra Nevada foothills by George B. Cleveland and Salem J. Rice, Division of Mines, 1954.

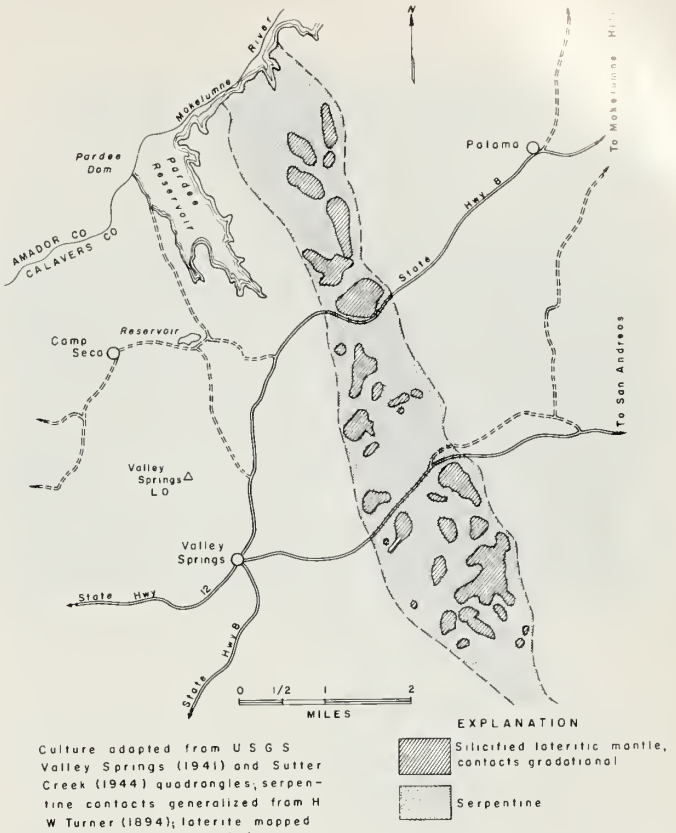
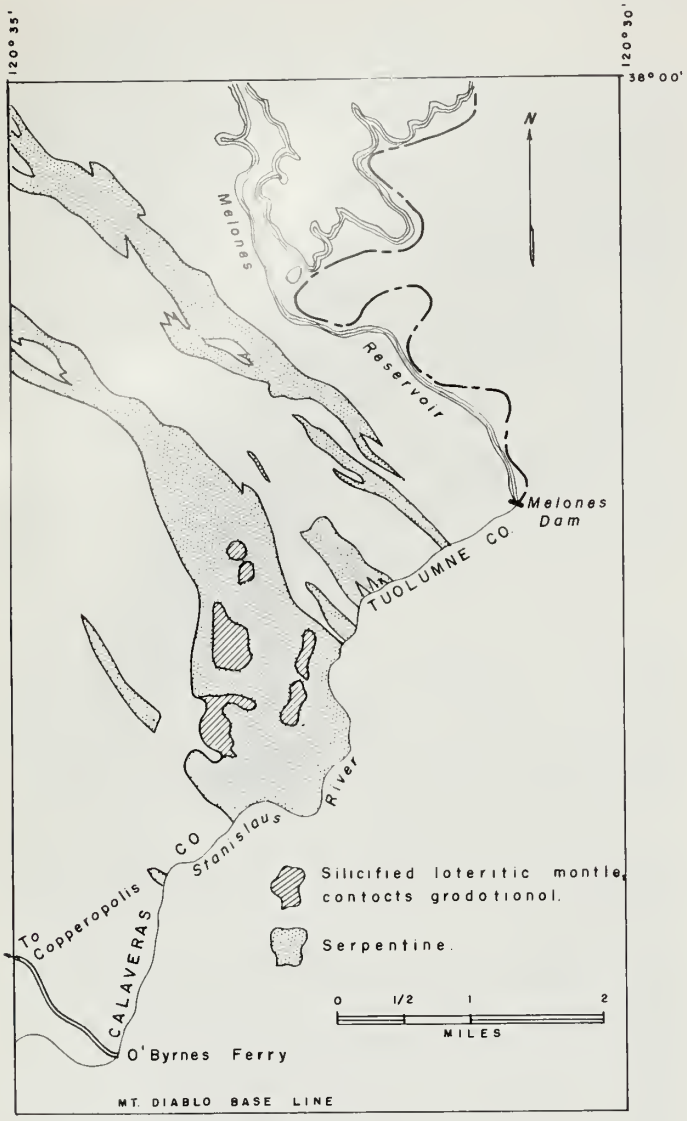


Figure 15. Map of Valley Springs area showing distribution of serpentine and laterite.

The lateritic remnants in the Sierra Nevada foothills consist of three distinct zones that grade into one another, although all three zones have not been observed in the same outcrop. The basal magnesite zone contains magnesite in the form of dense, white veins in serpentine below the intensely weathered or silicified zone. The intermediate silicified zone is characterized by a dense boxwork and massive silicified serpentine composed of brown and bluish-gray chalcedony. The upper iron-oxide zone, observed only in a few residual patches, consists of a basal layer of dark yellowish-orange limonite, and a surface layer composed principally of reddish-brown, porous hematite.

In Calaveras County most of the evidence of lateritic weathering consists of leached silica-boxwork and silicified serpentine capping hills in the Valley Springs and O'Byrnes Ferry areas. This resistant material, commonly 100 feet or more thick in hill-top remnants, contains sparse veins of garnierite and chrysoprase, but the average nickel content of sampled outcrops is about the same as that of the underlying serpentine. Thus erosion has removed most of what was probably a more or less continuous lateritic mantle, and leaching since early Tertiary time has probably removed much of the nickel concentrated in the mantle at that time.



Culture odopted from U.S.G.S. Copperopolis quodrongle (1941), serpentine contocts from Tolioferro ond Solori (1948); loterite mopped by G.B Clevelond, (1954).

Figure 16. Map of Copperopolis area showing distribution of serpentine and laterite.

Platinum Metals

For a number of years, a few ounces of platinum and related metals were recovered annually as a by-product of placer gold mining. Most of this was from bucket-line gold dredges in the Calaveras River near Jenny Lind and the Mokelumne River near Camanche (Logan, 1925, p. 163). The largest yield, 54 ounces valued at $2,433, was in 1917. None has been produced in the county since 1941.

Although platinum-group metals are believed to have been formed originally in basic and ultrabasic intrusive rocks, they are known in Calaveras County only as alloys in smooth thin flakes and small rounded nuggets in placer deposits. The proportion of platinum metals to gold in these deposits usually is small.

Precious and Semi-precious Minerals

A number of fine mineral specimens have been found in Calaveras County. Probably the best known have been the specimens of native gold in quartz that have been taken from some of the Mother Lode mines and many of the East and West belt mines. The largest and most famous specimen was the 195-pound mass of gold found at Carson Hill in 1854. Also, a number of large nuggets have been taken from placer deposits; a 94-ounce gold nugget was found south of Campo Seco in 1854.

Good quartz crystals have been found in Chili Gulch south of Mokelumne Hill and at the McSorley Ranch (see chapters on Quartz crystal and Placer gold). A 5-inch flawless sphere and a 7-inch flawed sphere were cut from quartz taken from this area (Murdoch and Webb, 1956, p. 277). Buried gravels at Chili Gulch also have yielded considerable amounts of rich white opal. Moss agate has been taken at Stockton Hill.

Another noted locality in Calaveras County is Garnet Hill, where for years excellent specimens of coarsely crystallized garnet and epidote have been collected. Crystalline specimens of calcite and aragonite are found at many of the limestone deposits in the county and at Carson Hill; stalactites are found in some of the limestone caves. Appreciable quantities of specimen material of copper minerals, including azurite, chrysocolla, chalcanthite, and covellite, have been taken from mines in the Foothill copper belt. Gold tellurides were reported to have been recovered during the early days of mining at Carson Hill.

In addition, other minerals occasionally are found as good specimen material in Calaveras County—mariposite and ankerite from Mother Lode gold mines, kammererite and uvarovite from some of the chromite deposits, rhodonite from manganese deposits, and pyrite and other sulfide minerals from gold and copper mines.

Quartz Crystal

Quartz crystals for use in the manufacture of quartz crystal oscillators have been mined at Chili Gulch, 2½ miles south of Mokelumne Hill. The piezoelectric properties of certain large flawless quartz crystals permit a precise control of the frequency in radio transmitters and other electronic equipment. Crystals suited to this application are rare and in great demand during times of national emergency.

Most of the State's quartz crystal output has been from the Rough Diamond and the Green Mountain drift mines on the east side of Chili Gulch. Quartz crystal mined here in 1897-98 was used as ornamental material (Kunz, 1905, pp. 64-65). A small amount of work was done again during World War I. In World War II several thousand pounds of quartz crystal were mined from these properties, but only a small fraction of this was of electronic grade (Wright, 1957, p. 460). For descriptions of the Green Mountain and Rough Diamond drift mines refer to the chapter on Placer gold.

Quicksilver

Cinnabar (HgS), the principal ore of quicksilver, has been reported to be present in small amounts at the Oro y Plata gold mine north of Murphys (Turner and Ransome, 1898, p. 8). There has been no recorded quicksilver production in Calaveras County.

Silica

Vast quantities of silica—largely in the form of quartz sand, but also to a lesser extent in quartzose gravel and massive quartz veins—are present in Calaveras County. Since 1957 large amounts of silica sand have been produced at Camanche by Pacific Clay Products and shipped to the San Francisco Bay area for use in the manufacture of glass containers. In 1924 quartz was mined from a massive vein at the Iron Rock claim at Carson Hill (Logan, 1925, p. 170).

The Eocene Ione formation covers an area of about 4 square miles in the northwest portion of Calaveras County. The upper member of this formation, which consists of clayey sand, is mined at Camanche. In this area the sand covers hundreds of acres and is 150 or more feet thick.

Quartzose gravel that was deposited in early Tertiary channel deposits is abundant in Calaveras County, especially in Chili Gulch where there are extensive accumulations of hydraulic mine tailings containing a high percentage of quartz pebbles, cobbles, and boulders. Massive quartz veins are present along the Mother Lode gold belt and to the east and west. However, those most suitable as a source of silica are at Carson Hill and Chaparral Hill, where there are massive veins of white "bull quartz" tens of feet thick and several thousand feet in length. Many East belt and West belt veins are too limited in extent and contain too many impurities to be suitable as sources of silica. Along the extreme southwest border of Calaveras County on the Echandi Ranch is an undeveloped massive quartz vein approximately 100 feet long and 30 to 40 feet wide.

Pacific Clay Products *

Location: Sec. 7, T. 4 N., R. 10 W., M.D.M., 1 mile east of Camanche and 1 mile south of the Mokelumne River. Ownership: Frank Genoccio and Mark Davis, Camanche, California; leased to Pacific Clay Products, 1255 West 4th Street, Los Angeles; J. D. Fredericks, president, and H. W. Coke, plant superintendent.

Since the Spring of 1957, silica sand has been produced here by Pacific Clay Products and shipped to the San Francisco area, where it is used in the manufacture of glass containers. Clay-bearing sand is mined in an open pit and piped to a recently erected modern plant, where it is processed by classification and flotation. The company has approximately 400 acres under lease.

Raw material is obtained from an upper member of the Ione formation. The deposit has been explored by about 40 drill holes ranging from 200 to 300 feet in depth, most of which did not reach bedrock. The sand horizon has an average thickness of about 150 feet and lies on clay, below

* Since the writing of this report the town of Camanche has been leveled and the plant auctioned, in preparation for construction of Camanche Dam.

Photo 40. Pacific Clay Products sand-clay pit at Camanche. The hydraulic pit is in the center foreground. Camera facing east.

which there is additional sand. There is a soil overburden of about 5 feet. The sand and clay beds dip about 2° SW.

The sand contains an average of 5 percent clay minerals, but there are thin beds of clay within the sand. The crude sand contains an average of 75 to 80 percent quartz, 15 to 20 percent feldspar, 3 percent heavy minerals, and 1 percent pebbles and fragments of chert and quartz. The sand grains are subangular to angular. Magnetite, ilmenite, and zircon are by far the most abundant of the heavy minerals. Other heavy or dark minerals, in decreasing abundance, are tourmaline, garnet, staurolite, rutile, epidote, and pyrite. Recovery of fine silica from the minus 200-mesh waste fractions is being planned. Also investigations of the clay, quartz-flotation rejects, and heavy minerals are being made (H. W. Coke, personal communication, 1958).

Photo 41. Yard stockpile and building at the Pacific Clay Products silica plant at Camanche. Camera facing west.

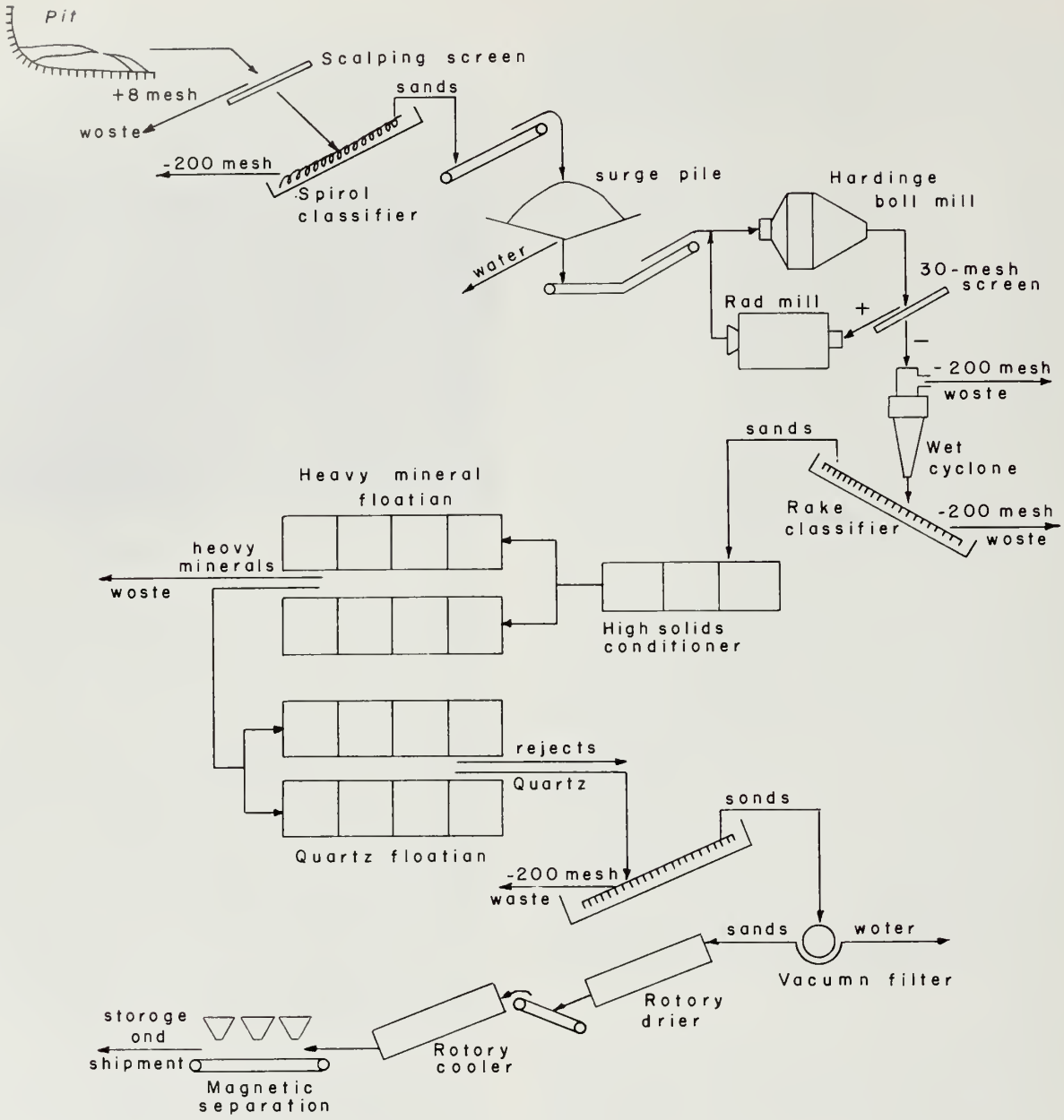


Figure 17. Flowsheet of Pacific Clay Products plant.

The deposit is mined by a combination of benching and hydraulicking in an extensive open pit (see photo 40). The east portion of the pit is mined in 30- to 50-foot benches with a bulldozer and tractor-drawn scrapers which deliver the clay into the hydraulic pit or sump at the west end. At the hydraulic pit, which was approximately 100 feet deep in the Fall of 1957, the bank is undercut with a 2½-inch hydraulic monitor, and a slurry is formed at the bottom of the pit. The slurry is then pumped up to a vibrating 8-mesh screen at the edge of the pit where oversize and trash are removed. Undersize is then pumped through a steel pipe to the plant. The plant flowsheet is shown in figure 17. Plant capacity is 35 tons per hour. Typical analyses of finished glass sand are as follows (Utley, 1957, p. 74):

Gradation	Percent
+20-mesh	nil
30-mesh	3.78
40-mesh	24.98
50-mesh	33.93
70-mesh	19.40
100-mesh	10.25
140-mesh	5.57
200-mesh	1.69
−200-mesh	.40
Composition	
SiO_2	92.4
Fe_2O_3	.047
Al_2O_3	3.26
CaO	trace
Na_2O	.42
K_2O	2.97

The alumina portion of about 3¼ percent is controlled within narrow limits so that it is not necessary to blend the sand with additional feldspar at the glass plants (Utley, 1957, p. 72).

Finished material is shipped either in paper bags or in bulk. Bulk material is trucked to the railroad at Burson about 3½ miles to the south.

Silver

The recorded value of the silver output of Calaveras County from 1880 to 1957 is $1,960,815. Virtually all of this has been a by-product of gold and copper-zinc mining. Silver is alloyed with gold in lode and placer deposits and with sulfides in gold and copper-zinc deposits. At present only minor amounts are produced, as there is little active gold or copper-zinc mining.

Stone

Beginning with the earliest days of exploration and settlement in Calaveras County, local stone has been utilized in many different ways. Decorative and dimension stone were obtained locally in the early days from small quarries in granite, limestone, rhyolite tuff, serpentine, and sandstone deposits. More recently, lightweight aggregate has been obtained from deposits of pumicite and rhyolite tuff. Crushed rock from granite, lode mine dumps, rhyolite tuff, and andesitic sand was used in road construction. Sand and gravel for use as concrete and bituminous aggregate and road base has been obtained from river gravels and hydraulic tailings. Rhyolite tuff and greenstone have been crushed to produce roofing granules. Blasting sand was obtained from smelter slag as a byproduct of glass-wool manufacture, and dredge tailings were used as a source of tube-mill pebbles.

Phata 42. Anather view af the Pacific Clay Praducts silica sand plant at Camanche shawing yard stackpile to left, building cantaining flotatian unit and drier in center, and starage silas ta right. Camera facing east.

Photo 43. Stone fence of rhyolite tuff near road north of Valley Springs. Many of these fences were built by Chinese coolies. *Photo by Mary Hill.*

Crushed and broken stone. A variety of sources in Calaveras County have yielded crushed and broken stone since the 1920s, most of which has been used in the manufacture of aggregate. Approximately 57,000 cubic yards of crushed granite were produced for Pacific Gas and Electric Co.'s Salt Springs dam from late 1928 to late 1931. Small amounts of semi-consolidated pumice and pumicite were produced from the Warren and Wallace deposits west of Valley Springs, beginning in 1942, for use as lightweight aggregate. This material is in thin surficial beds of limited lateral extent in the Valley Springs formation. The Peirano quarry east of Altaville also is in the Valley Springs formation. A small outcrop of hard, massive tuff was first quarried there in the 1850s for building stone, but since 1948 it has been crushed and used in lightweight aggregate blocks, as road rock, and terrazzo. Small amounts of rock from numerous mine dumps have been mined, crushed, and screened for use as road construction material. (See section on Road construction materials.)

Dimension and decorative stone. Homes of the early settlers and public buildings of the later inhabitants were made of crude building blocks of local stone, and some were faced with dressed and finished slabs of local, good-quality decorative stone. Granite facing was used in San Andreas and Calaveritas; rhyolite-tuff blocks and facing were used in Mokelumne Hill, Altaville, Angels Camp and Vallecito; limestone blocks and rubble were used in Douglas Flat and Murphys; tuffaceous sandstone was used in Campo Seco and Jenny Lind; and serpentine was used at Pool Station and Copperopolis. Greenstone and schist, abundant throughout the more populated parts of the county, also were utilized in most of these towns.

The Late and Wildermuth quarries near Valley Springs are in sandstone of the Ione formation, which is exposed extensively in the area between Valley Springs, Jenny Lind, and the Mokelumne River. Some white sandstone from the Late quarry was sold as decorative stone in Stockton in the 1870s, and dark gray sandstone from the Wildermuth quarry was used locally prior to 1906.

The Valley Springs formation, which is exposed in erosion remnants principally northeast of Angels Camp and between Railroad Flat and Sheep Ranch, was a principal source of building block and decorative stone in the early days. The Peirano quarry east of Altaville had a small recorded production in the 1850s. More recently, the Gianelli deposit at Douglas Flat has yielded white rhyolite tuff that was used locally as building and garden stone, and the Peirano quarry has yielded crushed tuff used as terrazzo. Stained tuff from the Lava Point quarry was marketed as wall rock and garden stone in the 1950s. Hand-trimmed tuff and broken fragments from the Irvine quarries south of Mokelumne Hill have been used since 1947 as building block, garden stone, and terrazzo. An outcrop of banded schist was exposed in 1957 at the Eclipse drift mine south of Mokelumne Hill; this material was to be used as garden stone.

Slate from the Mariposa formation was quarried on a small scale near Copperopolis prior to 1915 and in 1936-37. It was used for roofing and as flagstone.

Marble in Calaveras County is part of a great mass of limestone and is in many small, scattered lenses within the Calaveras formation; these lenses commonly are only a few tens of feet wide and a few hundred feet long. Many of them were prospected in the early days but only the large deposits have any recorded production.

The marble generally is compact, fine-grained, and white with gray streaks. The Angels and Eagle quarries southeast of Vallecito are situated near the western edge of the very large Columbia limestone mass, and were active prior to 1915. The Sundborg property in this same area has yielded yellow marble for terrazzo in recent years.

From 1924 to 1928 small amounts of soapstone were produced in Calaveras County, but there has been no recorded production since. Talc and soapstone deposits are associated with serpentine, and rarely exceed a few tens of feet in width or more than a hundred feet in length. The color of this material ranges from greenish-gray to light brown. One of the most extensive soapstone deposits in the county is south of San Domingo Creek, between 2 and 4 miles west of Murphys (Logan and Franke, 1936, p. 235). This deposit consists of a series of north- to northwest-striking lenses of light brown soapstone interbedded with quartz-mica schist. Several lenses on the east side of the deposit are 30 to 40 feet wide and more than 100 feet long. A few years ago several large blocks were removed but not marketed. Other deposits in the county include the Peirano, half a mile north of Carson Hill, which yielded more than 100 tons in 1925-27; the Laidet deposit 4 miles east of Railroad Flat; and a deposit near Vallecito. Talc and soapstone from Calaveras County have been used locally for boiler linings and fireplace brick and have been sold as building stone.

Road construction materials. Materials suitable for road construction include lode-mine tailings, hydraulic, dredge, and drift-mine tailings, creek gravel, disintegrated granite, rhyolitic tuff and sand from the Valley Springs formation, and andesitic sand from the Mehrten formation. More than 70 properties in Calaveras County that contain road construction materials are listed in table 3, wherein the rock type,, uses, and physical test data—the materials are summarized. The test data and statements regarding uses were compiled from the files of the California Division of Highways, District X office, Stockton.

Laboratory tests are used to evaluate the suitability of materials for road construction and to predict their behavior under expected traffic conditions. The principal tests performed on road construction materials are for specific gravity, resistance to deformation and abrasion, sizing, absorption or moisture content, soundness, and organic content. The various test methods used by the California Division of Highways are briefly summarized in the paragraphs following (G. T. McCoy, 1954, and G. T. McCoy et al, 1955). The abbreviation in parentheses following the names of some of the tests is the designation used to report the results of that test in table 3.

Specific gravity (D; Df for minus-4-mesh fraction, Dc for coarse fraction): Ratio between the weight of a given volume of material and that of an equal volume of water. A sample is weighed in air and again in water; the welght of the sample in air divided by the difference between the weights is the specific gravity.

Sieve analysis (in table 3, analyses in columns headed 6 to ⅜ are inches; 4 to 270 are mesh; 5m and 1m are microns): A sample is weighed and passed through vibrating sieves of progressively finer size. The fractions accumulating on each screen are then weighed, and results are reported as the total percentage passing each screen.

R value (R): The resistance, mostly frictional, that soil used as sub-grade or base offers to plastic displacement. It is measured on an arbitrary scale in which 0 is a liquid and 100 a solid. From this value, highway engineers can estimate the thickness of higher-quality cover necessary to prevent displacement of the sub-grade or base. The test is performed in a stabilometer, which is a vertical metal cylinder with an inner lining of rubber, resting on a steel stage. A light oil is placed between the lining and the metal side of the cylinder, and the compacted specimen to be tested is placed inside the lining. A static load is applied to the specimen from above, causing it to distort horizontally and thus displace some of the oil. The R value is computed from a formula that takes into account the vertical pressure on the specimen, its internal horizontally acting pressure, and the amount of oil displaced. Angular material has a higher R value than rounded material; plastic materials, such as clay, have low R values.

Bearing value: [California Bearing Ratio, a value used prior to adoption of the stabilometer test (R value) in the late 1940s.] A specimen is compacted in a mold that leaves the surface exposed. It is then soaked in water and allowed to expand for a given length of time. The new total height of the sample is measured and recorded as a percentage of its original height.

Sand equivalent (SE): A value that indicates the amount of detrimental fines or clay-like materials in soil or mineral aggregate, reported on a scale of 0 to 100 in which 100 is a clay-free material. Minus-4-mesh material is added to a chemical solution in water in a long tube, agitated, and allowed to stand vertically. After the sand, clay, and solution have separated for a given period of time, the heights of the sand and of the clay suspension in the tube are measured. The height of the sand is reported as a percentage of the height of sand plus clay.

Los Angeles Rattler (LA; first value or range of values is for 100 revolutions, the second for 500): Measures the resistance of mineral aggregate to combined impact and abrasion. A sample is graded to a particular size and weighed, then is placed in a horizontally revolving cylinder with several 1-pound steel balls. It is rotated 100 or 500 times, after which the sample is resieved and reweighed. The loss in weight is reported as a percentage of the original weight.

Wet Shot: Measures the resistance of coarse aggregate to abrasion in the presence of water. The procedure is the same as in the Los Angeles Rattler test, except that water is added to the cylinder.

Moisture content: A sample containing the same amount of moisture as when it was excavated is weighed, thoroughly oven-dried, and weighed again. The loss in weight caused by evaporation of contained moisture is reported as a percentage of the dry weight of the sample.

Absorption (M): The procedure is the same as in testing the moisture content, except that the sample is saturated with water before the intial weighing.

Swelling: Measures the resistance of a compacted surface to water. The surface of a specimen is covered with water; the vertical swelling at the end of 24 hours is reported in thousandths of an inch.

Soundness: Measures the resistance of mineral aggregate to disintegration. Each size fraction of a sample is weighed and immersed in a hot solution of sodium or magnesium sulfate for several hours, removed, dried, and resoaked. After drying a second time, the fractions are resieved and reweighed. The average loss in weight for the sample is reported as a percentage of its original weight.

Organic impurities: A sample of sand is cleaned of visible particles of bark, wood, grass, etc. A 3 percent NaOH solution is added to the sand and allowed to stand for 24 hours. Comparison of the color of the solution with a colored glass standard reveals the presence of detrimental trace amounts of organic impurities.

Table 3. Noncommercial borrow sources, Calaveras County, showing geology, uses, and physical test data. Courtesy California Division of Highways, District X

Property & map no.	Location	*Material and use	Amt. used reserves (date)	*Physical properties	Sieve analysis (percent through)																		Remarks
					Inches									Mesh								Microns		
					6	3	2½	2	1½	1	¾	½	⅜	4	8	16	30	50	100	200	270	5m	1m	
Airola D-78	SW¼ 12, NW¼ 13, NE¼ 14-3-12	Creek gravel; base, untreated surface.	Unknown; 42,800 yds. (1931)	D=2.70; LA=9.0, 35.2; M=1.0			94	83	73	55	44	34	26	17	14	12	9	7	5	4	4			Material o.k. if crushed and graded.
T. Airola D-79	SW¼ 18-2-14	Dredge tailings; UB, PMS.		Df=2.73-2.82; Dc=2.60-2.75; R=74-84; SE=36-61, 52; LA=7.0-8.6, 30.2-35.6		88	70	67	59	48	40		21	8	6	4	4	3	2	2			Wet shot test: 23.8-24.1. Estimated sieve analysis: 10% retained on 6″ screen 2% retained on 18″ screen.
V. Airola D-80	NW¼ 34-4-12	Creek gravel; base, MA.	Unknown; 40,000 yds. (1940)		55	% e	xcee	ds 2	½″														Bearing value at 0.1″ in soake compacted sample=118%. Material must be crushed, screened.
Allen [illegible]	SW¼ 13-4-11	Creek gravel.	30,000 tons; depleted (1948)																				
Allison D-82	SW¼ 21-4-10	Creek-run gravel; chiefly quartzite, some basalt, granite, schist, minor chert, serpentine, opaline jasper; ½″ max. PMS, UB.	1,000 yds; extensive (1958)	Df=2.63-2.67; Dc=2.55-2.61; R=78-86; SE=29-59, 30					66	54	48	39	35	27	23	20	14	6	4	3			Material drains freely. Gravel up to 6″ size; rounded to subrounded.
Altaville mine D-83	NW¼ 21-3-13	Mine tailings; gravel; untreated base; RMS, PMS.		R=77-85; SE=54	100	64	47	38	23	11	5	3	2	1									
Armstrong (Licking Fork Lumber Co.) D-85	SE¼ 18-6-14	Rhyolite tuff.	Not used; 20,000 yds. (1944)	Df=2.43; Dc=2.04; LA=12.0, 46.0; M=9.3					100	90	69		40	26	21	17	13	11	9	8	3			Bearing value at 0.1″ in soaked, compacted sample adjusted to 35% plus-4 mesh=85%. Material crushed to —1½″ when sized.
Bacon D-86	SE¼ 15-4-9	Hydraulic tailings; ISM, MA, PMS.	500 yds; 30,000 yds. (1953)	Df=2.74; Dc=2.68 (PMS only); R=83 (ISM only); SE=42 (ISM only)					99	98	97		94	68	60	54	41	25	13	8	7			Material suitable if washed. Worked by front-end loader 1957.
Bailey D-87	SW¼ 24-5-13	Rhyolite and rhyolite tuff; Type "B" PMS.	300+ yds; extensive (1958)	R=58-82; SE=18-22, 20				100	97	78	67		48	36	29	22	19	16	14	13	13			Probably same as Geo. Poore property.
Barton (Huberty) D-88	NW¼ 22-4-12	Disintegrated granite; for maintenance.	10,000 yds; 500+ yds. (1958)							100	97		57	37	27	21	16	13	10	8			Large fresh granite boulders piled in center of pit; fresh or nearly fresh granite rims much of pit.
Big Spring mine D-89	SE¼ 3-2-13	Mine tailings; greenstone; RMS.	600 yds; 1,500 yds. (1958)	R=75-87; SE=31-37, 35																			
Bruner mine D-90	NE¼ 10-2-13	Mine tailings; greenstone and soil.	300 yds; 300 yds. (1958)																				
Bullion mine D-91	NE¼ 10-2-13	Mine tailings; massive and phyllitic greenstone; imported borrow.	600 yds; 400 yds. (1958)			Flo	ur to	18″															Worked by front-end loader and truck, 1958. Largest fragments hand-cobbed; 3 dumps. See Marble Spring mine.
Burns D-92	SW¼ 12-5-13	Creek gravel.	5,000 yds; 20,000 yds. (1941)																				
Burson pit	SW¼ 21 SE¼ 20 } 4-10	Creek gravel; UB, RMS.		Df=2.64; Dc=2.60		100		85	76	67	60		44	34	29	24	17	9	5	3	3			Same as Allison, March, Walter, which see.

Calaveras Cement Co.	Calaveritas Creek	Untreated rock surface.		R: see remarks; M average = 6.2-7.6%		100	91	80	68	53	44		32	25	22	19	16	12	9	6	5	2	1	Source probably near V. Airola, which see. Bearing value at 0.1″ in soaked, compacted sample = 78-118%.
Calaveras Central mine D-93	NE¼ 28-3-13	Drift mine gravel tailings; PMS.		Df = 1.68-2.88; Dc = 2.69-2.70; R: see remarks								100	82	60	43	30	23	18	12	9	8			Bearing value at 0.1″ in soaked compacted sample = 121%. Gravel contains 0.2-0.6% moisture.
Calaveras Land and Timber Corp.	SW¼ 32-6-16	Disintegrated granite; tuffaceous sand; RMS, imported base.	4,000 yds. (1957)	Df = 2.58-2.64; Dc = 2.08-2.18; R = 57-82; SE = 19-52, 44		93	90	89	86	85	84		38	77	71	59	47	36	27	20				
Cerrutti D-95	SW¼ 13-4-11	Creek gravel; chiefly schist, granite, some slate, quartz; UB.	Not used; 6,000 yds. (1953)	Df = 2.77; Dc = 2.70						100	98		55	34	28	21	17	12	9	7	6			Gravel rounded to sub-angular. Bearing value at 0.1″ in soaked, compacted sample = 160%.
Cosgrave D-96	NE¼ 14-3-12	Creek gravel; chiefly schist, quartzite.	8,400 tons; 1,000 yds. (1958)		Sand to 8″																			Gravel subrounded to sub-angular.
Crystal mine D-97	NE¼ 33-3-13	Mine tailings; greenschist; imported borrow.	30 yds; 2,000± yds.	R: See Remarks			100	97	83	68	59		40	29	24	17	15	12	10	9	8	1	1	Probably meant adjacent "Lightner" mine, as Crystal mine has insignificant dump. Bearing value at 0.1″ in soaked, compacted sample = 103%. Reserves in irregular piles.
Darby (Morrison) D-98	NE¼ 25-4-14	Consolidated water-laid Mehrten sand; angular fragments up to 2″ uncommon; occasional thin clay beds; imported borrow.	No production; (1958) 50,000 yds. (1956)	D = 1.82-2.12 (in place); R = 18-85, est. average 70; SE = 25-61, 45										100	96	88	76	61	44	32				Material contains 13.6% moisture in place. Consolidated material will require drilling, blasting. Bulldozing, drilling May 1958. Slight overburden.
Del Orto #1 D-99	NW¼ 35-6-12	Disintegrated granite; ISM.	1,000 yds. + (1958)	R = 64-85; SE = 44-66, 54										100	94	77	56	40	26	16				Benched pit; east face 50′ high. Diorite in faces of pit less weathered than in pit proper.
Del Orto #2 D-100	SE¼ 11-5-11	Hydraulic tailings; chiefly quartz, some schist, quartzite; UB, PMS.	100 yds; 15,000 ± (1958)	Df = 2.66-2.67; Dc = 2.64-2.67; SE = 40-79, 73; LA = 10-11, 49; M = 0.1-0.2		65	30	14	11	9	8		6	5										Production in 1957.
E.B.M.U.D. D-102	SW¼ 3-4-10	Tunnel rock-waste; largely greenschist; UB, PMS.	25,000 tons (1955)	Df = 2.74-2.82; Dc = 2.70-2.74; R = 82-85; SE = 67-68, 67½; LA = 5.0, 20.6-21.8; M = 0.1-0.2					73	64	56		39	24	17	12	9	7	5					Wet shot test: 13.5-19.6.
Fazzi mine (Jolly Tar) D-104	NW¼ 29\3-13 NE¼ 28/	Mine tailings; greenschist and black Calaveras schist.	400+ yds; 1,000± yds. (1958)				100	97	86	68	61		41	28	23	19	15	13	11	9	8	1	1	Bearing value at 0.1″ in soaked, compacted sample = 137%.
Felix Mining Co. D-105	NE¼ 30-2-12	Mill sand.	500 yds. (1939)																					
Ghiglieri D-107	E½ 24-2-13	Mill sand; imported borrow.	10,000 yds. (1956)	R = 72-82; SE = 23-54, 35; M = 4.9-13.3											100	99	93	64	39	28		26		
Ghost mine D-108	SW¼ 34-3-13	Mine tailings, greenstone; ISM.	100 yds; 150 yds. (1958)	R = 76-79; SE = 42			100	98	94	89	83		66	48	37	28	22	17	13	11				Material massive but slabby.
Gold Cliff mine D-110	SE¼ 33-3-13	Mine tailings, fresh, slabby greenstone; RMS.	200+ yds; 300+ yds.	Df = 2.84-2.88; Dc = 2.83-2.86; SE = 49					75	54	44		31	22	17	13	10	7	6	5				
Golden River mine D-112	SE¼ 19-3-14	Drift mine gravel tailings; UB, PMS.		R = 9-70 est. average 50; SE = 20	100	83	73	65	50	43	41		37	32										Five samples showed two distinct types of sieve analyses.
					See Remarks				100	89	81		62	47										
Harris mine	See Oriole																							
Herbert D-113	NW¼ 20-4-11	Clean Valley Springs sand with fragments of rhyolite, quartz, quartzite, greenstone, rhyolite tuff.	1,300 yds.; 7,700 yds. (1958)	R = 64-77; SE = 64-66, 65	Sand to 3″; more than 80% is sand.																			Some dredge tailings also on property. Some overburden.
Howard D-115	SE¼ 14-3-13	Fluvial tuffaceous sand.	25,500 tons (1958)																					Active summer 1957. Pit 125′ x 200′.5 ft. overburden.

Table 3. Noncommercial borrow sources, Calaveras County, showing geology, uses, and physical test data. Courtesy California Division of Highways, District X—Continued

Property & map no.	Location	*Material and use	Amt. used reserves (date)	*Physical properties	Sieve analysis (percent through)																	Remarks
					Inches									Mesh							Microns	
					6	3	2½	2	1½	1	¾	½	⅜	4	8	16	30	50	100	200	270	5m	1m	
Huber D-116	SW¼ 4-5-12	Tertiary gravel; chiefly schist, quartzite, some granite.	500+ yds.; 10,000 yds. (1943)		Sand to 6″.																			Several shallow hydraulic pits Gravel rounded and subrounded.
Hutchison D-117	SW¼ 1-5-11	River gravel; chiefly granite, granodiorite, diorite, some schist, quartz; PMS.	No production; 10,000 yds. (1958)	Df=2.74-2.90; Dc=2.70-2.75; SE=71-80, 75; LA=10.7, 32.7; M=0.3-0.5	Large cobbles, boulders up to 3′ common									19 in clean	13	9 sand.	5	3		2		1	1	Gravel angular, subangular.
Jenny Lind D-119	NE¼ 28-3-10	Stream gravel; chiefly quartzite, quartz, some greenstone, schist; PMS.	100+ yds. 200 yds. cleaned and in stockpile; 1,500+ yds. raw reserves (1958)		Sand to 8″; average 1″.																			Portable washing plant sizes minus 1″. Gravel rounded to subrounded.
Jolly Tar	See Fazzi																							
Kramer D-121	E½ 14-4-13	Mine tailings; gravel.		M aver.=5.3-7.0%			100	99	95	84	76		63	51	48	42	33	20	12	7	5			Bearing ratio at 0.1″ on soaked compacted sample = 140%.
Kreye D-122	SW¼ 17-3-14	Creek gravel.	20,000 yds. (1950)																					On Coyote Creek. Probably same as Valente, which see.
Licking Fork Lumber Co.	See Armstrong																							
Marble Springs mine D-124	SE¼ 3}2-13 NE¼ 10}	Mine tailings; imported borrow.	5,000 tons (1941)				100	91	86	76	70		52	36	32	25	21	16	13	10	9	2		Bearing value at 0.1″ in soaked, compacted sample=114%. Bearing value, sieve analysis, and reserves are data for Mother Lode Central mine, which consists of Bullion and Marble Springs mines.
March D-125	SE¼ 20}4-10 NE¼ 29}	Creek gravel; chiefly quartzite, schist, some quartz, basalt, granite.	Prob. not used; 20,000 yds. (1948)																					Gravel rounded, subrounded. Downstream from Allison, which see for test data.
McCarty D-126	NE¼ 8-5-12	Hydraulic mine tailings.	5,000 yds.; (1943)																					
Melones D-127	SE¼ 24-2-13	Mine tailings; greenstone.	300+ yds.; extensive (1958)		Fines to 3″.																			Material in tiny stockpile crushed to minus 1″.
Meuli D-128	NE¼ 8-2-14	Disintegrated granite.	100+ yds.; 1,000 yds. (1953)																					Surge pile, conveyor belts, 1½″ punched plate.
Meyer D-129	SW¼ 21-3-10	Dredge tailings; chiefly greenstone, schist, some quartz, quartzite, andesite, serpentine(?); PMS.	Prob. not used; 25,000 tons (1955)	Df=2.63-2.79; Dc=2.62-2.76; SE=38-40; LA=6.2=6.6, 25.8-26.4; M=0.4-0.8					63	47	34		15	9	7	6	5	4	3	3				Wet shot test: 12.9-17.6.
Mohawk mine D-130	NE¼ 31-3-13	Mine tailings; greenschist and massive greenstone.	500± yds; 150± yds. (1958)		Fines to 6″; some large																			Div. Forestry used 75 yds. in Altaville, 1957; rest used by owner.
C. Neilsen D-132	SW¼ 7-4-12 SE¼ 12-4-11	Rock.	40,000 yds. (1937)																					

F. Neilsen D-133	NE¼ 12-4-11	Dredge tailings; UB, PMS.	6,600 yds. (1955)	Df=2.74-2.84; Dc=2.66-2.76; R=72-82; SE=30-55, 40; LA=9.6, 35.8; M=0.5-0.8		91	87	80	72	56	47		29	24	22	20	17	13	10	8				Wet shot test: 24.5.
Oriole mine (Harris mine) D-134	SW¼ 3-2-13	Mine tailings; greenstone, some Calaveras schist; UB.	13,000 tons; 500 yds. (1958)	Df=2.78; Dc=2.78; R=67-82; SE=30-46, 38			100	95	82	66	55		25	24	20	14	11	8	6	4				State used 11,000 tons 1955 in Altaville-Murphys road; County used about 2,000 tons prior to 1955. Tailings crushed, screened on property by portable plant.
Orvis	18-7-18	Creek gravel; imported borrow; RMS, MA.		Df=2.67; Dc=2.41; R=67-84; Se=52; M=1.11		100			96	89	84	80	79	75	71	70	61	49	31	20				
Osborne mine D-135	SE¼ 30-3-13	Mine tailings; greenschist, some greenstone.	300+ yds; 2,500+ yds. (1958)		Fines to 6″																			Front-end loader, 6 trucks used 1957; Div. Forestry used material on Bear Mt. Lookout road.
Podesta D-137	NE¼ 10 | 4-9 NW¼ 11	Dredge tailings; chiefly schist, granite, quartzite, some basalt, quartz, diorite; type "B" PMS, UB.	100+ yds; 75,000 yds. (1954)	R=68-74; SE=62	Cobbles to 6″.				84	76	66	45	31	12	10	9	6	4	3	2	2			Gravel rounded, drains freely.
Porteous D-138	NE¼ 10-6-13	Rock and gravel bar; granite, schist, basalt, andesite, diorite, quartz; MA.	prob. not used; 100+ yds. (1958)		Sand to 6″.																			Gravel rounded.
Rathgeb mine D-139	Center 33-4-12	Mine tailings; greenschist.	Probably not used	Df=2.63; Dc=2.48; R=21-43; SE=19						100	95		62	48	42	36	28	20	16	14				Probably Union mine.
Reinking D-140	NE¼ 19-4-11	Sand; ISM.	1,000— yds; 2,500± yds. (1958)	R=23-77, est. aver. 70; SE=7-61, 40; M=13.2-16.4							100		99	98	94	86	75	49	32	20	17			
Riedel D-141	NE¼ 17-3-14	Placer tailings; UB, PMS.		Df=2.73-2.75; Dc=2.64-2.71; R=81-87; SE=66-73, 70; LA=6.2-8.0, 29.2-31.0; M=0.0025-0.2	See remarks						100		73	50	37	28	22	18	14	11				Material chiefly limestone, some quartz. Drains freely. Wet shot test: 24.9. Sieve analysis is on material crushed to —¾″.
Rindge No. 1 mine D-142	SW¼ 12-5-12	Mine tailings; Calaveras schist; imported borrow.	Several thousand yds. used; 18,000+ yds. (1940)	Df=2.77; Dc=2.65; SE=23				100	97	89	81		63	47	39	32	25	20	17	14				Portable crushing and sizing plant used by County in early 1950s.
Rolleri (Russel mine) D-143	NW¼ 3-2-13	Mine tailings; greenstone, some vein quartz; UB, subgrade.	500 yds; 1,000± yds.	Df=2.84; Dc=2.80; LA=9.8, 25.4; moist. aver. =3.2-5.9%		100					73		50	31	23	15	12	9	7	5				Fragments slabby. Bearing value at 0.1″ in soaked, compacted sample = 99%.
Russel mine	See Rolleri																							
Schwoerer D-144	NW¼ 19-3-4	Water-laid Mehrten sand with rounded cobbles up to 8″ in size; Class "C" cement-treated base and sub-base.	Not used; 150,000 yds. (1957)		More than 80% sand.																			Excavation limits planned at 400′ x 250′. 8-foot overburden. Drilled 1957.
Sherwood D-146	SW¼ 13 | 4-12 NE¼ 24	Dredge tailings.	10,000 yds. (1954)																					
Sierra Nevada Water and Power Co. D-147	NW¼ 24-6-13	Rhyolite tuff; imported base.	2,500 yds; 30,000 yds. (1944)	Df=2.58; Dc=2.12; M=0.8					100	99	98		92	82	73	65	58	52	48	41	39	17	5	Two adjacent pits; 2 benches each 15′ high in one pit. Rhyolite well broken by jointing. Bearing value at 0.1″ in soaked, compacted sample = 20% to 68%.
Stearman		Silty rhyolite tuff; imported borrow.		R=28-84 est aver. 68; SE=7-58, 39										100	78	66	57	49	43	37				Possibly same as Golden River mine, which see.
Steffa	See Vallecito-Western																							
Sturla D-148	NE¼ 30-3-14	Dredge tailings; chiefly metamorphic rocks, some quartz; PMS.	50,000 tons (1956)		Sand to 8″.																			Leased to Jupiter Lumber Co., 1956. Material dirty. Leased to Claude C. Woods; active 1958.
Swank D-149	SW¼ 9-6-14	Gravel bar; UB.	Not used; reserves small (1958)	M aver. =4.0-6.2																				Bearing value at 0.1″ in soaked, compacted sample = 122%

Table 3. Noncommercial borrow sources, Calaveras County, showing geology, uses, and physical test data. Courtesy California Division of Highways, District X—Continued

Property & map no.	Location	*Material and use	Amt. used reserves (date)	*Physical properties	Sieve analysis (percent through)																		Remarks
					Inches									Mesh							Microns		
					6	3	2½	2	1½	1	¾	½	⅜	4	8	16	30	50	100	200	270	5m	1m	
Trethaway D-151	SE¼ 23-5-11	Rhyolite tuff; imported borrow, cement-treated base.	Not used; extensive (1958)	R=21-88, est. aver. 72; SE=16-59, 24																			Material drains freely. Poor quality.
United States Government D-153	NE¼ 15-6-14	Mehrten lava; UB.	20,000 yds. (1944)	Df=2.68; Dc=2.40; LA=11.0, 36.0					100	98	78		42	22	15	10	7	5	3	2	2	1		Size analysis on material crushed to —1½″. Bearing value at 0.1″ on sample adjusted to 40% plus — 4 mesh soaked and compacted=178%.
Valente	S½ 17-3-14	Sand and gravel; UB, PMS.		Df=2.68; Dc=2.58; R=79-83; SE=66-84; M=0.44	100				64	48	35	20	12	5	4	3	2	2	1	1				
Vallecito-Western mine (Steffa) D-154	SW¼ 24-3-13	Mine tailings; gravel, chiefly granite, some quartz, quartzite, jasper, slate; imported borrow, RMS, untreated surf., MA.	1,000+ yds. (1958)	Dc=2.70		94	89	81	68	44	30		18	7	5	4	3	2	2	1	1			
Vicini No. 1 D-155	NW¼ 22-4-12	Disintegrated granite; Type "A" PMS.	400 — yds; small (1958)	R=54-76; SE=24										100	99	87	77	66	53	53	30			Removed by scraping; fresh granite boulders crop out on floor of scraped portion.
Vicini No. 2 D-156	NE¼ 11-5-13	Weathered Calaveras schist.	200 yds; indefinite (1958)																					Cut with 2 benches each 15′ high.
Walter D-158	SW¼ 21-4-10	Creek gravel.	Probably not used; 40,000 yds. (1952)																					Immediately downstream from Allison, which see. Gravel is of same type.
Woodworth D-160	SE¼ 36-4-10	Creek gravel; chiefly schist, greenstone, quartz, some granite, basalt; base reinforcing.	Not used; probably 2,000-5,000 yds. (1958)	Df=2.74; Dc=2.68			100	98	95	85	74		53	35	27	20	18	12	6	4	3			Swelling test satisfactory. Gravel rounded to subrounded. Dredge tailings nearby.

***Legend**

D------specific gravity
Dc-----specific gravity, coarse fraction
Df-----specific gravity, fine fraction
ISM----imported sub-base material
LA-----Los Angeles rattler test
M------absorption
MA-----minimum aggregate
PSM----plant-mixed surfacing
R------resistance
RMS----road-mixed surfacing
SE-----sand equivalent
UB-----untreated base

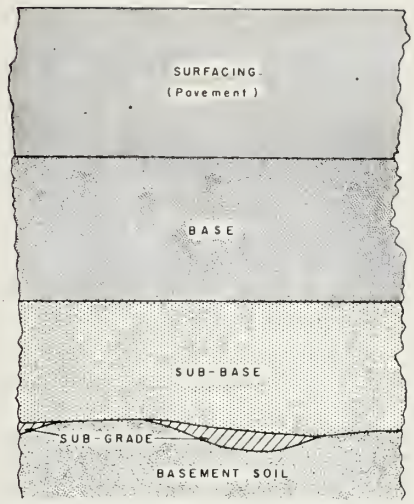


Figure 18. Schematic cross section of highway substructure.

After a potential source of road construction material has been tested by the above methods, the test results are analyzed and the material is declared suitable or unsuitable for any of the several components of a road or highway. The schematic cross section of a highway substructure shown in figure 18 indicates the principal components involved. In general, specifications for surfacing materials are more exacting than those for base, which in turn are more demanding than materials for sub-base. Soil or mineral aggregate may be used in an untreated condition, but if they do not meet specifications for their intended use, they must be treated. The variety of materials available and the possible treatments that can be administered to them to alter their physical properties have given rise to such terms as plant-mixed surfacing, cement-treated base, imported sub-base material, and untreated base. The uses to which road construction materials in Calaveras County are best suited are indicated in the third column in table 3. These uses are defined in the paragraphs following according to usage employed by the California Division of Highways (G. T. McCoy, 1954, and G. T. McCoy, et al., 1955); the abbreviations in parentheses following the names of some of the uses are the designation given them in table 4.

Imported borrow: Commonly, material used to make up a deficiency of roadway excavation material; it seldom enters into use as base or sub-base. It is obtained from sources the selection of which is optional with the contractor, as opposed to *local borrow*, which is obtained from sources that the contractor is obliged to use, in or near the highway right-of-way.

Sub-grade: Top layer of the basement soil, on which sub-base, base, or surfacing is placed. Sub-grade usually is native soil in place, but may be moved locally to eliminate irregularities. There are six classes of sub-grade.

Imported sub-base material (ISM): Material in the layer below the base. It usually is produced from nearby sources and conforms to less severe specifications than base material.

Imported base: Material of less restrictive sizing and quality than standard untreated base. In practice, there is little difference between imported and untreated base; the intended distinction is between material produced locally and that produced from a commercial plant.

Untreated base (UB): Material placed on the top portion of the roadbed, and which is part of the structural design of the roadway.

Cement-treated base: Materials used directly under a bituminous surfacing. They are divided into three classes, A, B, and C, generally of decreasing quality. Such bases give a limited slab-strength greater than natural materials but less than that of concrete. Cement-treated bases contain between 1 and 6 percent portland cement.

Class "C" cement-treated base: Uses 1 to 2½ percent portland cement. Its principal use is in base material where the R value is slightly less than that required by design specifications.

Untreated surfacing: Mineral aggregate used for surfacing without addition of bitumen or cement binder.

Road-mixed surfacing (RMS): A mixture of mineral aggregate and bituminous binder, mixed on the roadbed or a mixing table by road-mixing machines. The aggregate may be imported or local material.

Plant-mixed surfacing (PMS): Sized aggregate and asphalt mixed at a central plant and delivered to the roadbed in trucks, ready for placing. There are four types of mix, identified as Type A, Type B, Type C, and Open Graded. These types are of comparable quality but differ in intended use.

Specifications of the California Division of Highways (McCoy, G. T., 1954) for typical uses of crushed and graded mineral aggregate are shown in table 4.

Table 4. Specifications of the California Division of Highways for typical uses of crushed mineral aggregate (from G. T. McCoy, 1954).

Material crushed, max. size	*UB 1½ inch*	*RMS & Type "B" PMS ¾ inch*	*PCC concrete 1½ inch*
		percent passing screen	
Sieve 2 inch	100		100
1½ inch	90–100		90–100
1 inch		100	50–86
¾ inch	50–90	95–100	45–75
⅜ inch		65–80	38–55
4 mesh	25–50	45–60	30–45
8 mesh		30–45	23–35
16 mesh			17–27
30 mesh		15–25	10–17
50 mesh			4–9
100 mesh			0–3
200 mesh	3–9	3–7	0–2

Test	*UB*	*RMS & Type "B" PMS*	*PCC*
Wet Shot, max.	55%	50%	55%
LA Rattler			
(100 rev.) max.	---	---	10%
(500 rev.) max.	50%	50%	45%
R value, min.	78	35	---
SE, min.	30	45	80 *
Swell, max.	---	0.030"	---

* Average of 3 successive samples; no single sample may be less than 75.

Each rock type tested gives results that indicate the suitability of that rock type for use in road construction. The specific gravity of both the fine and coarse fractions of creek gravel, placer tailings, and lode tailings is consistently higher than the specific gravity of the respective fractions of disintegrated granite, rhyolitic sand and tuff, and material from the Mehrten formation. Creek gravel,

placer tailings, and disintegrated granite have higher minimum R values than lode tailings, rhyolitic rock, and material from the Mehrten, although the maximum R values of the six classes of rock are approximately equal. Creek gravel and placer tailings have the highest minimum sand-equivalent values, although again the maximum values of the six classes are about the same. There was no marked variation in results of the Los Angeles Rattler test among the different rock types.

The effect of rock type on the suitability of a deposit for road construction material is readily seen when the deposits in Calaveras County are tabulated according to the most stringent specifications they are able to meet. In table 5, some 38 properties are arranged according to rock type and use. The figures in each vertical column indicate the percentages of the rock type listed above that column that were found to be acceptable for the stated use.

Table 5. Suitability of rock types in Calaveras County quarries for specific road construction uses, expressed in percent.

	Rock types					
	Creek gravel	*Placer tails*	*Lode tails*	*Disintegrated granite*	*Mehrten fm.*	*Rhyolitic tuff & sand*
Number of properties tested	(14)	(12)	(6)	(2)	(2)	(2)
USES						
Mineral aggregate (portland cement concrete)	29%	17%				
Surfacing	42%	83%	50%	50%		
Untreated base	29%		33%		50%	
Treated base					50%	50%
Sub-base			17%	50%		50%
(Total)	100%	100%	100%	100%	100%	100%

Creek gravel has the largest number of deposits qualifying for use as aggregate in portland cement, a use that has strict specifications. The other rock types in the table are listed from left to right in order of decreasing ability to meet the specifications for surfacing and untreated base.

Proven reserves in deposits of road construction materials generally are fairly small, because ordinarily only enough material is blocked out to satisfy the immediate needs of a particular construction project. Lode mine tailings are the smallest type of deposit, whereas andesitic sand and rhyolitic tuff and sand usually are in shallow deposits of wide lateral extent. Disintegrated granite is in surficial deposits within the zone of weathering, in plutonic rocks ranging from granodiorite to diorite in composition. Deposits of road materials must be readily accessible to the construction project for which they are developed, and generally consist of rock that can be excavated without blasting. Front-end loaders, bulldozers, and power shovels are used to excavate the rock, which is crushed and screened at the excavation site or within a short distance of it.

In general, it is not possible for the deposits listed in table 3 to support long-term commercial production, because they lack the high quality and variety of mineral aggregate necessary to such an operation. As a result, the Division of Highways refers to deposits of this type as "non-commercial borrow sources". The Neilsen gravel plant in Chili Gulch is the only current commercial source of mineral aggregate in the county. In 1956 Beerman and Jones produced washed sand and gravel at Angels Camp and Fredrickson Bros. produced paving sand near Mokelumne Hill; and late in 1957 Claude C. Wood utilized gravel just north of Vallecito.

Road construction materials produced in Calaveras County have yielded royalties to their owners ranging from 2½ to 15 cents per cubic yard, depending on the quality and amount of material available and the distance from the deposit to the project where it is used.

Roofing granules. Roofing granules were first produced in Calaveras County in 1920 from the Ghost mine in Angels Camp. Greenstone from this mine was crushed and shipped to Richmond for use on roofing paper. The nearby Tryon mine was worked from about 1924 to 1941; three sizes of crushed greenstone were produced. During the 1950s Pacific Cement and Aggregates, Inc., produced roofing granules from rhyolite tuff of the Valley Springs formation at the Garamendi quarry south of Mokelumne Hill and from jasper capping serpentine at the Snyder quarry near Valley Springs. In 1958 massive greenstone of the Logtown Ridge formation at the Sherwood property near San Andreas was diamond-drilled by Minnesota Mining and Manufacturing Co. to determine its suitability for use as roofing granules.

Sand and gravel. The Neilsen gravel plant in Chili Gulch is the only continuously operated commercial source of sand and gravel in Calaveras County. It has been active since 1939. The plant processes Recent stream gravel, as well as placer tailings from hydraulic mining done prior to 1900, and from dredging done in the 1930s.

Approximately 824,500 tons of sand and gravel from placer tailings near Lancha Plana were processed by the East Bay Municipal Utility District during 1928-30 and 1934-35, for use as aggregate in constructing the Pardee Dam and related structures. The tailings are situated in both Calaveras and Amador Counties.

Large quantities of gravel are present south of Jenny Lind, in the Wallace-Camanche area, at Douglas Flat, and at Vallecito. The small areas near Melones and northwest of Hodson are finely ground mill tailings. Properties within each of the major bodies of creek gravel, placer tailings, and mill tailings have been tested by the California Division of Highways. Data on the geology, uses, and physical properties of these materials are shown in table 3 (see section on Road Construction Materials).

Miscellaneous. Slag from the copper smelter at Copperopolis (see section on Copper) was utilized in 1949 as a raw material for the manufacture of rock wool. John Johnson excavated and sold slag to a rock wool manu-

facturer, and crushed and sold an additional amount as blasting sand. Also, some slag from the dump at the site of the Penn mine smelter has been used.

In 1941, George Shaw produced tube-mill pebbles from placer tailings at Camanche, for use in grinding ceramic clays.

Garamendi quarry

Location: NW¼ sec. 19, T. 5 N., R. 12 E., M.D.M., in Old Woman Gulch about 1½ miles south of Mokelumne Hill. Ownership: Raymond Garamendi, Mokelumne Hill, California.

This property was leased and worked by Pacific Coast Aggregates, Inc., during 1954-55. (The company is now known as Pacific Cement and Aggregates, Inc.) One or two thousand tons of rock were quarried during this operation and trucked to the company's crushing and sizing plant at Kerlinger in San Joaquin County. When visited in 1957, the quarry face was about 100 feet wide and 25 feet high. Decorock, Inc., of San Francisco was the sales outlet for the finished material, which was used as roofing granules.

Rock at this quarry is a compact pink, purple, and gray rhyolite tuff that contains crystals of sanidine and pieces of pumice. It overlies cemented gravels of the Deep Blue Lead channel, although the pit floor is still in rhyolite. Approximately one third of the rhyolite quarried was lost as dust and fines during crushing and sizing. The following data are an average of laboratory tests on this rock at Plant No. 4 of Pacific Cement and Aggregates, Inc., for 6 months ending July 1, 1957 (Lee Collins, Operations Manager, personal communication, 1957):

Analysis of rhyolitic roofing granules from Garamendi quarry.

Name	Color	Size, inches	Size analysis % passing U. S. Sieve 2½	2	1½	1	¾	½	⅜	¼	#4	#8
Carnation	pink	2½x1½	100	94	28	3	1					
Carnation	pink	½x ⅛					100	97	63	33	17	2
Linda	gray	½x ⅛					100	99	76	38	19	2

Name	Size, inches	Sp.G.	Absorption %	Loose wt. lbs./cu. yd.
Carnation	2½x1½	-----	-----	-----
Carnation	½x ⅛	2.14	9.7	1800
Linda	½x ⅛	2.06	14.4	1800

Neilsen Gravel Plant Co.

Location: NW¼ sec. 25, T. 5 N., R. 11 E., M.D.M., in Chili Gulch, about 2½ miles south of Mokelumne Hill; office and batching plant in San Andreas. Ownership: c/o C. W. Nielsen, San Andreas, California; Ray Neilsen, manager.

The Neilsen gravel deposit consists of Recent stream gravel; tailings from hydraulic mining prior to 1900, and from dredging in the 1930s; and some virgin gravel of the Chili Gulch channel (see section on Placer gold). It has been worked for aggregate by the Neilsens since 1939. The gravel consists principally of quartzite, vein quartz, andesite, basalt, and lesser amounts of granite and schist. The sand is composed of quartzite, schist, quartz, and some hornblende and mica in the finer sizes.

Gravel from this deposit meets Division of Highways specifications for mineral aggregate suitable for portland cement concrete structures. The following test data on pit-run material from the Neilsen property are typical, information obtained from Division of Highways, District X office, Stockton:

Analysis of pit-run material from Neilsen gravel deposit in Chili Gulch.

Size, inches	Sp.G.	Sieve analysis, % passing U. S. screen 1½	1	¾	⅜	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	No. 270
1½ inch	2.69	100	86	25	2	1							
¾ inch	2.50-2.61		100	95	25	2							
sand	2.73					100	88	69	46	21	7	3	2

Absorption for the 1½-inch gravel is 0.9 percent by weight. Soundness test, $MgSO_4$, for the ¾-inch gravel is 5.1 percent loss. The organic-material test for the sand is satisfactory.

Six sizes of gravel and two sizes of sand for aggregate, and four sizes of material for road fill, are prepared and marketed by the Neilsen Gravel Plant Co. The aggregate plant at Chili Gulch includes a trommel, crushers, vibrating screens, and rake and spiral classifiers. A sluice with a quicksilver trap was installed late in 1957 to recover fine flour gold. In addition to this plant, a portable Willard batching plant is used frequently, and a 3-yard Noble batching plant for ready-mix concrete is operated in San Andreas.

Photo 44. Neilsen sand and gravel plant. Yard stockpiles in foreground. Camero facing north.

Pardee Dam

Location: SW¼ sec. 26, T. 5 N., R. 10 E., M.D.M., on the Mokelumne River. Ownership: East Bay Municipal Utility District, 2130 Adeline Street, Oakland 23, California.

This company was active in Calaveras County during 1928-30 and 1934-35, when approximately 824,500 tons of sand and gravel were processed and used in construc-

tion of the Pardee Dam and Tunnel, Jackson Creek Siphon Spillway, the South Spillway, and other appurtenances. The source of the sand and gravel was the placer tailings near Lancha Plana, which are situated in both Calaveras and Amador Counties.

The gravel was excavated by dragline, then washed, sized, and delivered to bunkers by an overhead tramway. No crushed rock was produced.

Peirano quarry

Location: NW¼ sec. 27, T. 3 N., R. 13 E., M.D.M., 1 mile north of Angels Camp. Ownership: John P. Lemue, Angels Camp, California.

Rhyolite tuff from this property reportedly was first quarried in the 1850s and was used as building stone for structures in Altaville, Angels Camp, and Vallecito (Heizer and Fenenga, 1948, p. 116). The quarry has been intermittently active since. During the 1950s it was leased first to Calaveras Concrete Products and then to the Jupiter Lumber Co.

The rhyolite tuff is a fine-grained, tough, massive, grayish-white material that caps a small hill. It is 130 feet thick, roughly circular in shape, and about 500 feet in diameter. There is no overburden, and the tuff rests on late Tertiary gravels and green schist. Only the uppermost 20 feet of the tuff is quarried, as concrete blocks made from tuff below the 20-foot zone tend to crack and crumble at low temperatures. Lapilli of pumice are rare in the quarried rock, but are moderately common in the layer of tuff immediately below.

Photo 45. Peirano rhyalite tuff quarry. Camera facing north.

The quarry is on the south side of a low hill; it is 40 feet long, 25 feet wide, and 15 feet deep. The rock is blasted, trammed by hand to a small crushing and sizing plant, crushed, sized, and stored. Two sizes of crushed tuff are produced. The smaller size, minus ⅜ inch, is used in the manufacture of pink concrete blocks sold under the name "Tuftile"; the larger size, ⅜ to ¾ inch, is used as road gravel, decorative gravel, and terrazzo. "Tuftile" is produced at the plant of Calaveras Concrete Products in Murphys, which has a capacity of 60 cubic yards of mix per day. However, the plant is not operated continuously, but only in response to demand for the product.

Snyder quarry

Location: SE¼ sec. 7, T. 4 N., R. 11 E., M.D.M., about 2 miles northeast of Valley Springs. Ownership: John Snyder, Valley Springs, California. Lessee: Pacific Cement and Aggregates, Inc. (formerly Pacific Coast Aggregates, Inc.).

Approximately 1500 tons of crushed rock were produced from this property during 1954-55 by Tyrrell-Hannah Co. (B. Tyrrell, personal communication, 1957). The rock was trucked to Kerlinger in San Joaquin County, where it was crushed and sized by Pacific Coast Aggregates, Inc. Since 1955, this company has leased and intermittently worked the property directly, producing a modest amount of rock which also was crushed and sized at Kerlinger. Decorock, Inc., of San Francisco is the sales outlet for the finished material, which was used as roofing granules.

The rock at this quarry is a brownish-yellow jasper, some of which has a sub-opaline luster. It forms a cap 10 to 12 feet thick, overlying altered serpentine. Approximately one third of the rock quarried was lost as dust and fines during crushing and sizing. The following data are an average of laboratory tests on this rock at Plant No. 4 of Pacific Cement and Aggregates, for 6 months ending July 1, 1957 (Lee Collins, Operations Manager, personal communication, 1957):

Analysis of roofing granules from Snyder quarry jasper.

Name	Color	Size, inches	Size analysis % passing U. S. Sieve 1½	1	¾	½	⅜	¼	#4	#8
Linda	brown	1½x¾	100	61	20	1				
Linda	brown	½⅛			100	96	70	40	22	3

Name	Size, inches	Sp.G.	Absorption %	Loose wt. lbs./cu. yd.
Linda	1½x¾	-----	-----	-----
Linda	½x⅛	2.42	3.4	2200

Tellurium

During the early operations at the gold mines at Carson Hill, tellurium-bearing minerals were encountered in quantity. Most were lost, however, in futile attempts to extract the gold. These minerals included petzite (Ag_3AuTe_2), calaverite ($AuTe_2$), hessite (Ag_2Te), sylvanite ($(Au,Ag)Te_2$), altaite (PbTe), melonite ($NiTe_2$), and nagyagite ($Pb_5Au(Te,Sb)_4S_{5-8}$). Minor amounts of native tellurium also were found. Calaverite was first discovered and identified at the Stanislaus mine (Murdoch and Webb, 1958, p. 82), and melonite at the Melones mine (Burgess, 1948, p. 89). Tellurium minerals also are present at the French wood mine at Robinson's Ferry and the Ford mine just east of San Andreas, and

native tellurium was reported to have been found near Angels Camp.

Tungsten

During 1953 and 1954 tungsten ore was mined in the Garnet Hill area in northeastern Calaveras County. The sources of production were the Garnet Hill and Moore Creek mines. However, because of low prices, the only present activity (1958) is a small amount of development work being done at the Moore Creek mine. This is the only locality in Calaveras County where tungsten is known. The area was probably first prospected for copper during the 1860s, but for many years following it was best known for the fine garnet and epidote crystals that were collected here. Both mines were prospected for tungsten during World War II, but there was no recorded production.

Tungsten and various amounts of copper and molybdenum ore minerals are in north-trending tactie bodies at the crest of Garnet Hill, and south of Moore Creek half a mile to the southwest. These tactie bodies are roof pendants in granodiorite and were developed by contact metamorphism when calcareous rocks were intruded by the granodiorite. The tactite consists of coarse-grained garnet and epidote with smaller amounts of calcite and quartz. Most of the granodiorite adjacent to the tactite is gneissic. The ore bodies are zones within the tactite that contain disseminated fine- to coarse-grained scheelite. These zones may be in or near the center of the tactite, or may extend across the entire width. Most of the scheelite grains are subhedral, but a few well-formed crystals several inches long have been found. Associated with the scheelite are various amounts of molybdenite, chalcopyrite, pyrite, and bornite. In some places masses of copper-bearing sulfides 1 to 2 feet in diameter have been found. At the Moore Creek mine coarse flakes of molybdenite are abundant.

Garnet Hill mine

Location: Secs. 6 and 7, T. 7 N., R. 16 E., M.D.M., at the top of Garnet Hill, 2 miles west of Salt Springs Reservoir and approximately 25 miles by road east of Pioneer Station. Ownership: North American Tungsten, Inc., Gazette Building, Reno, Nevada.

Little is known of the early history of this property, but it may have been prospected for copper during the 1860s. It long has been known as a source of fine garnet and epidote crystals. The property was prospected again during World War I, and during the 1920s and 1930s numerous mineral collectors visited the area. During World War II, the area was prospected for tungsten by a number of persons and concerns including the Garnet Hill Tungsten Syndicate (Jenkins, 1942, p. 312), L. A. Smith, and Marsman and Company, but there was no recorded output. Also during this time, the property was briefly examined by the U.S. Geological Survey for the Reconstruction Finance Corporation (Paul Bateman, personal communication, 1955).

In 1953 and 1954, the mine was operated by the North American Tungsten Mining Company, A. L. Damon, president. Ore was mined in an open pit on the west tactite body and trucked to the mill at the Church gold mine, 5 miles south of Placerville, El Dorado County, where it was treated by flotation. Concentrates were shipped to Bishop for sale. Operations ceased in 1954, and except for annual assessment work, the mine has been idle since.

Photo 46. Garnet Hill.

This deposit is at the crest of Garnet Hill, a steep-sided dome-shaped peak just south of the Mokelumne River. Scheelite with various amounts of molybdenite and chalcopyrite are scattered sporadically in a series of north-striking parallel tactite bodies (see fig. 19). The most extensive tactite body, which is on the west side, is nearly 800 feet long and ranges from 20 to 35 feet in width. Two other major deposits lie to the east, and there are several smaller bodies. Country rock in the vicinity of the tactite consists chiefly of medium-grained gneiss with small amounts of quartz-mica schist and granodiorite. Much of the tactite contains little or no scheelite, but locally it contains scheelite in extremely finely disseminated grains, and in a few places on the surface well-formed crystals as much as 2 inches in length have been found.

Chalcopyrite containing minor amounts of gold and fine- to coarse-grained molybdenite are irregularly dis-

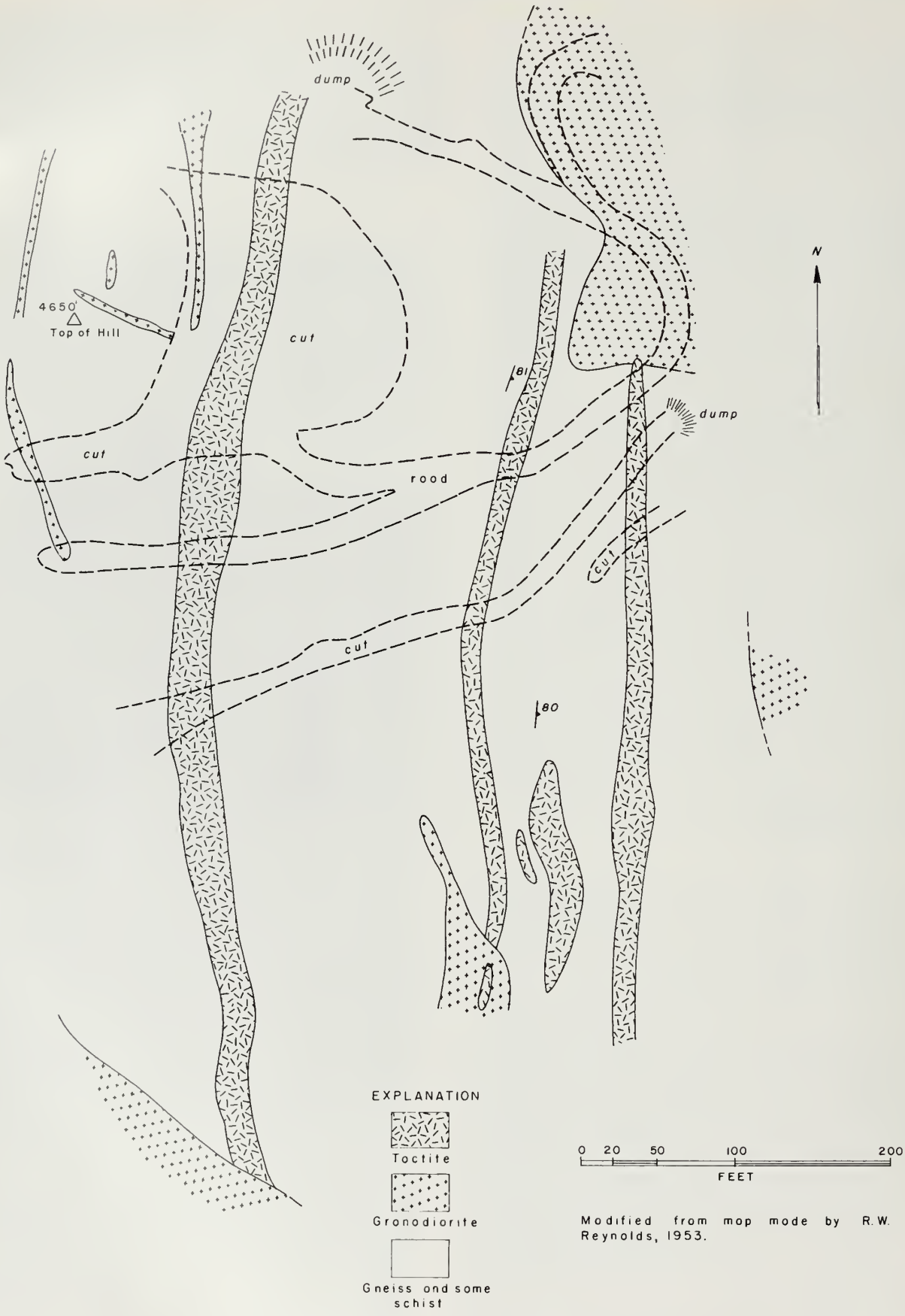


Figure 19. Mop of top of Garnet Hill.

tributed throughout the tactite. The principal scheelite-bearing zone, which is in the west tactite body, is 20 to 25 feet wide and approximately 500 feet long. The ore that was mined in 1953-54 contained from 0.3 to 0.5 percent WO_3 (J. H. Wren, personal communication, 1958). The mine is developed by an open pit, several open cuts and an 80-foot adit, now caved, that extends south from the north side of the hill.

Moore Creek mine

Location: Sec. 7, T. 7 N., R. 16 E., M.D.M., on the south side of Moore Creek and half a mile southwest of Garnet Hill. Ownership: Moore Creek Mining Company, P. O. Box 78, Pioneer, California; C. W. Decker, president.

This property consists of a number of claims, the most important being the Moore Creek tungsten-molybdenum-copper mine. It is believed to have been prospected for copper during the 1860s, but nothing is known of these early operations. The property was prospected again during World War I, and a 40-foot adit was driven. In 1942, the property was prospected for tungsten by G. C. Bruce and C. R. Smith (Jenkins, 1942, p. 312), but there was no reported production. In the Fall of 1954, the newly organized Moore Creek Mining Company gained control of the property. This concern erected a mill and has operated the property since. In the Fall of 1955 as much as 40 tons of ore per day was mined and milled, but since the price of tungsten and copper fell in 1957, only intermittent development work has been done.

Scheelite, molybdenite, and chalcopyrite, with smaller amounts of pyrite and bornite, are found in a series of discontinuous parallel lensoid tactite bodies. These bodies have a northeast strike, dip steeply to the southeast, and range from only a few feet to about 30 feet in thickness (see fig. 20). So far, six such bodies have been exposed in the workings and by diamond drilling. Commonly, the tactite bodies are associated with several calcite-rich zones. Country rock in the general area is medium-grained diorite, granodiorite gneiss, micaceous schist and massive granodiorite. The scheelite is moderately coarse-grained and is disseminated through much of the tactite. The copper sulfides, chiefly chalcopyrite, are erratically distributed in the tactite and are in irregular masses. Several masses more than a foot in diameter have been recovered. The molybdenite is in coarse flakes in much of the tactite and in fine flakes in disseminated form in some of the adjacent granodiorite. Ore mined in the Fall of 1955 contained an average of one-half percent WO_3 (C. W. Decker, personal communication, 1955).

The mine is developed by a main 150-foot south crosscut adit, several hundred feet up the steep slope south of Moore Creek, from which several short drifts and crosscuts have been driven. Approximately 105 feet above the main adit is the old 40-foot adit and a quarry approximately 40 feet wide and 30 feet deep. At the mill, which is several hundred feet west of the main adit portal, the

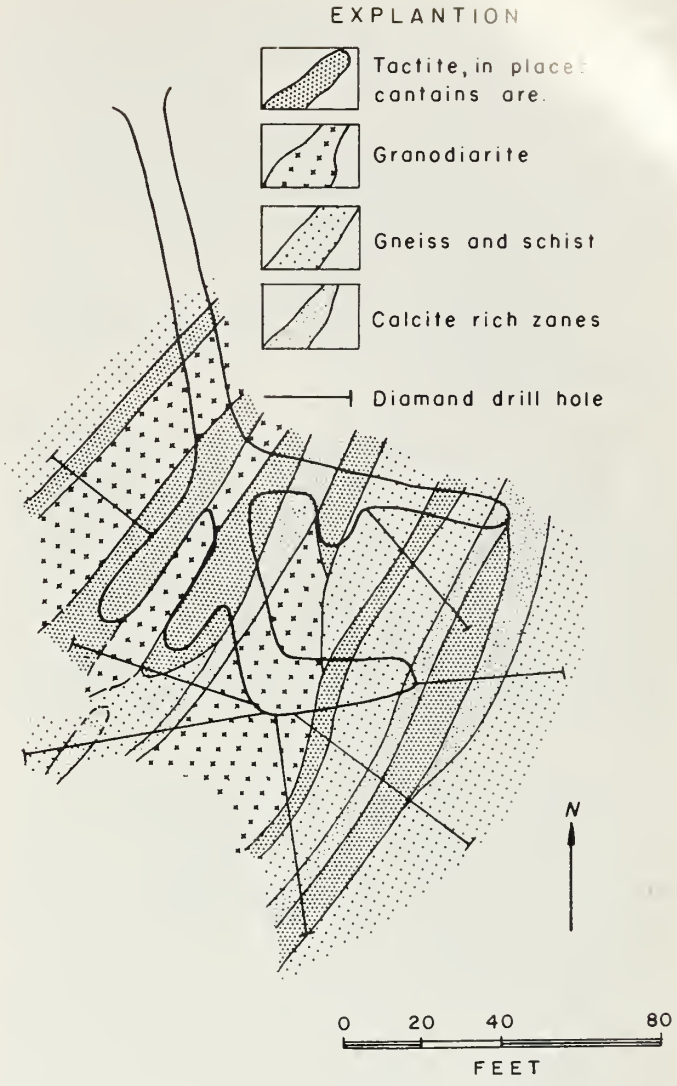


Figure 20. Map of the Moore Creek mine.

Photo 47. Mill at the Moore Creek tungsten-molybdenum-copper mine.

ore was sent through a jaw crusher, Herman-type ball mill with a 16-mesh screen outside of the liners, and then to two rubber-deck Dunham tables where a tungsten concentrate was recovered. Table middlings, which contained the molybdenum and copper, were dewatered, sent to a conical ball mill, and then to a flotation unit. Flotation concentrates consisted of molybdenum, and the tailings contained copper, both of which were dried and stockpiled separately. Tungsten concentrates were cleaned by retabling and averaged 60 to 65 percent WO_3. They were trucked to Fresno for magnetic separation and then sold in Bishop. Molybdenum concentrates were sold in San Francisco.

Uranium

Although there was some uranium prospecting in Calaveras County from 1952 to 1956, the only known deposit was at the Union gold mine (see Union-Rathgeb mines under Lode gold). In 1887, acicular black crystals of uraninite with yellow uranium oxide were found associated with a high-grade gold pocket on the 120-foot level (Logan, 1935, p. 147). In 1954, the Uravan Uranium and Oil Company of Salt Lake City, Utah, leased the property to explore for uranium. The Union shaft was cleaned out to a depth of 150 feet, but no uranium was found.

BIBLIOGRAPHY

American Journal of Mining, 1866-69, Some entries, vols. 1-7, (superseded by the Engineering and Mining Journal).

Aubury, Lewis E., 1902 (1905), The copper resources of California: California Min. Bur. Bull. 23, pp. 187-198.

Aubury, Lewis E., 1906, The structural and industrial materials of California: California Min. Bur. Bull. 38, 412 pp.

Aubury, Lewis E., 1908, The copper resources of California: California Min. Bur. Bull. 50, pp. 228-245.

Averill, Charles Volney, 1943, Strategic minerals, Sacramento district, Calaveras County: California Div. Mines Rept. 39, pp. 72, 139, 313-316, 552-555.

Averill, Charles Volney, 1946, Placer mining for gold in California: California Div. Mines Bull. 135, pp. 235-254.

Boalich, E. S., et al., 1920, The clay industry in California: California Min. Bur. Prelim. Rept. 7, pp. 43-44.

Bovery, P., 1926, Mining on the Mother Lode in California: Eng. and Min. Jour., vol. 122, pp. 457-458.

Bowen, Oliver E. Jr., and Crippen, Richard A. Jr., 1948, Geologic maps and notes along Highway 49: California Div. Mines Bull. 141, pp. 55-62.

Bowen, Oliver E. Jr., 1949, Calaveras County: California Div. Mines Bull. 142, pp. 37-40.

Bradley, W. W., 1903, Mill of the Melones Mining Company: Mining and Scientific Press, vol. 86, no. 4, p. 53.

Bradley, W. W., Huguenin, E., Logan, C. A., Tucker, W. B., and Waring, C. A., 1918, Manganese and chromium in California: California Min. Bur. Bull. 76, pp. 121-123, 216-217.

Browne, J. Ross, 1867, Reports upon the mineral resources of the United States, 360 pp.

Browne, J. Ross, 1868, Reports on the mineral resources of the States and Territories west of the Rocky Mountains for 1868: House Exec. Docs., no. 202, 40th Congress, 2d Sess.

Brown, J. A., 1890, Calaveras County: California Min. Bur. Rept. 10, pp. 147-152.

Brown, Horace F., 1903, New plant of the Royal Consolidated Mines Co., Ltd., Hodson, California: Mining and Scientific Press, vol. 86, no. 21, p. 336.

Burgess, John A., 1935, Mining gold on Carson Hill: Eng. and Min. Jour., vol. 136, no. 3, pp. 111-114.

Burgess, John A., 1937, Mining methods at the Carson Hill mine, Calaveras County, California: U.S. Bur. Mines Inf. Circ. 6940, 15 pp. (mimeo).

Burgess, John A., 1948, Mining on Carson Hill: California Div. Mines Bull. 141, pp. 89-90.

California Blue Book, 1954, Calaveras County, pp. 657-658.

California Division of Mines, 1956, The mineral resources of the Ione formation: Mineral Inf. Service, vol. 9, no. 8, pp. 1-5.

Cater, Fred W. Jr., 1948, Chromite deposits of Calaveras and Amador Counties, California: California Div. Mines Bull. 134, Part III, Chap. 2, pp. 33-60.

Chesterman, C. W., 1956, Pumice, pumicite, and volcanic cinders in California: California Div. Mines Bull. 174, pp. 36, 53.

Clark, Lorin D., 1954, Geology of the Calaveritas quadrangle, Calaveras County, California: California Div. Mines Special Report 40, 23 pp.

Clark, William B., 1955, Mines and mineral resources of San Joaquin County: California Jour. Mines and Geology, vol. 51, pp. 21-95.

Crawford, J. J., 1894, Calaveras County: California Min. Bur. Rept. 12, pp. 66, 89-100, 391, 404.

Crawford, J. J., 1896, Calaveras County: California Min. Bur. Rept. 13, pp. 57, 96-125, 527-528, 627.

Dietrich, Waldemar Fenn, 1928, The clay resources and the ceramic industry of California: California Div. Mines and Mining Bull. 99, pp. 67-70, 263, 299, 316, 337.

DeGroot, Henry, 1882, Hydraulic and drift mining: California Min. Bur. Rept. 2, p. 188.

Durrell, Cordell, 1944, Geology of the quartz-crystal mines near Mokelumne Hill, Calaveras County, California: California Div. Mines Rept. 40, pp. 423-433.

Egenhoff, Elisabeth L., 1949, The elephant as they saw it: California Jour. Mines and Geology, vol. 45, 128 pp.

Engineering and Mining Journal, 1869-present, Some entries.

Eric, John H., 1948, Tabulated list of Calaveras County copper deposits: California Div. Mines Bull. 144, pp. 218-223.

Eric, John H., Stromquist, Arvid A., and Swinney, C. Melvin, 1955, Geology of the Angels Camp and Sonora quadrangles, Calaveras and Tuolumne Counties, California: California Div. Mines Special Rept. 41, 55 pp.

Fairbanks, Harold W., 1890, Geology of the Mother Lode region: California Min. Bur. Rept. 10, pp. 23-90.

Fairbanks, Harold W., 1896, Ore-deposits with especial reference to the Mother Lode: California Min. Bur. Rept. 13, pp. 665-672.

Forstner, William, 1908, Copper deposits in the western foothills of the Sierra Nevada: Mining and Scientific Press, vol. 96, pp. 743-748.

Haley, Charles Scott, 1923, Gold placers of California: California Min. Bur. Bull. 92, 167 pp.

Hamilton, Fletcher, 1920, A review of mining in California during 1919: California Min. Bur. Prelim. Rept. 6, pp. 15-17.

Hamilton, Fletcher, 1922, A review of mining during 1921: California Min. Bur. Prelim. Rept. 8, pp. 25-29.

Hammond, John Hays, 1888, The milling of gold ores in California: California Min. Bur. Rept. 8, pp. 692-735.

Hammond, John Hays, 1890, The auriferous gravels of California: California Min. Bur. Rept. 9, pp. 105-138.

Hanks, Henry G., 1882, Calaveras County: California Min. Bur. Rept. 2, Part I, p. 8; Part II, p. 188.

Hanks, Henry G., 1884, Copperopolis, Campo Seco, Satellite, and Sunrise copper mines: California Min. Bur. Rept. 4, pp. 148-151.

Heizer, Robert F., and Fenenga, Franklin, 1948, Survey of building structures of the Sierran gold belt—1848-70: California Div. Mines Bull. 141, pp. 91-164.

Heyl, George R., 1948a, Ore deposits of Copperopolis, Calaveras County, California: California Div. Mines Bull. 144, pp. 93-110.

Heyl, George R., 1948b, The zinc-copper mines of the Quail Hill area, Calaveras County, California: California Div. Mines Bull. 144, pp. 111-126.

Heyl, George R., 1948c, Foothill copper-zinc belt of the Sierra Nevada, California: California Div. Mines Bull. 144, pp. 11-29.

Heyl, George R., Cox, Manning W., and Eric, John H., 1948, Penn zinc-copper mine, Calaveras County, California: California Div. Mines Bull. 144, pp. 61-84.

Hinds, Norman E. A., 1952, Evolution of the California landscape: California Div. Mines Bull. 158, 240 pp.

Irelan, William Jr., 1887, Calaveras County: California Min. Bur. Rept. 6, Part II, pp. 27-42.

Irelan, William Jr., 1888, Calaveras County: California Min. Bur. Rept. 8, pp. 121-157.

Irelan, William Jr., 1890, The dry and seam diggings: California Min. Bur. Rept. 9, pp. 36-38.

Jenkins, Olaf P., 1932, Geologic map of northern Sierra Nevada: California Div. Mines Rept. 28, pp. 279-298.

Jenkins, Olaf P., 1938, Geologic map of California, scale 1"=8 mi., California Div. Mines, 6 sheets.

Jenkins, Olaf P., 1942, Tabulation of tungsten deposits of California to accompany economic mineral map No. 4: California Div. Mines Rept. 38, p. 312.

Jenkins, Olaf P., 1948, Geologic history of the Sierran gold belt: California Div. Mines Bull. 141, pp. 23-28.

Julihn, C. E., and Horton, F. W., 1938, Mines of the southern Mother Lode region, part 2—Calaveras County: U. S. Bur. Mines Bull. 413, 140 pp.

Kerr, M. B., 1900, Register of mines and minerals, County of Calaveras, California: California Min. Bur., 27 pp.

Knopf, Adolph, 1906, Notes on the foothill copper belt of the Sierra Nevada: Univ. California, Dept. Geol. Sci. Bull., vol. 4, pp. 411-423.

Knopf, Adolph, 1929, The Mother Lode system of California: U. S. Geol. Survey Prof. Paper 157, 88 pp.

Levensaler, L. A., and Rohlfs, O. D., 1940, unpublished report on the Gwin mine, Calaveras County, 32 pp.

Lindgren, Waldemar, 1911, The Tertiary gravels of the Sierra Nevada of California: U. S. Geol. Survey Prof. Paper 73, 226 pp.

Logan, C. A., 1921, Calaveras County: California Min. Bur. Rept. 17, pp. 419-424.

Logan, C. A., 1923a, Notes on the West Point district, Calaveras County: California Min. Bur. Rept. 18, pp. 15-21.

Logan, C. A., 1923b, Calaveras County: California Min. Bur. Rept. 18, pp. 97-99.

Logan, C. A., 1923c, Calaveras County: California Min. Bur. Rept. 19, pp. 16-18, 143-144.

Logan, C. A., 1924, Calaveras County: California Min. Bur. Rept. 20, pp. 4-7, 76-80, 178.

Logan, C. A., 1925, Calaveras County: California Min. Bur. Rept. 21, pp. 135-172.

Logan, C. A., 1926, Copper in California: California Min. Bur. Rept. 22, pp. 372-376.

Logan, C. A., 1935, The Mother Lode gold belt of California: California Div. Mines Bull. 108, pp. 125-152.

Logan, C. A., and Franke, Herbert A., 1936, Mines and mineral resources of Calaveras County, California: California Div. Mines Rept. 32, pp. 226-364.

Logan, C. A., 1947, Limestone in California: California Jour. Mines and Geology, vol. 43, pp. 216-219.

McCoy, G. T., 1954, Standard specifications: California Div. of Highways.

McCoy, G. T., Withycombe, Earl, and Harris, Milton, 1955, Construction manual: California Div. of Highways, 6th ed.

Mining and Scientific Press, 1860-1921, Numerous entries, vols. 1-125.

Mining World, 1952, California's Penn zinc mine: Mining World, vol. 14, no. 7, pp. 21-24.

Morse, F. B., 1887, Willard Mining Company: California Min. Bur. Rept. 6, Part 2, pp. 35-42.

Moss, F. A., 1927a, Geologic map of the Mother Lode in the vicinity of Carson Hill, Calaveras County, California: unpublished doctor's thesis at Univ. of California, Dept. Geol. Sci. Library, Berkeley, California.

Moss, F. A., 1927b, The geology of Carson Hill: Eng. and Min. Jour., vol. 124, no. 26, pp. 1010-1012.

Murdoch, Joseph, and Webb, Robert W., 1948, Minerals of California: California Div. Mines Bull. 136, 402 pp.

Murdoch, Joseph, and Webb, Robert W., 1956, Minerals of California: California Div. Mines Bull. 173, 452 pp.

Neale, W. G., 1927, California: The mines handbook, 1926, pp. 425-562.

O'Brien, J. C., and Crosby, J. W., 1950, Copper: California Div. Mines Bull. 156, pp. 300-307.

Piper, A. M., Gale, H. S., Thomas, H. E., and Robinson, T. W., 1939, Geology and ground water hydrology of the Mokelumne Hill area, California: U. S. Geol. Survey Water-Supply Paper 780, 230 pp.

Preston, E. B., 1893, Calaveras County: California Min. Bur. Rept. 11, pp. 167-178.

Ransome, F. L., 1900, Mother Lode district folio, California: U. S. Geol. Survey Geol. Atlas of the U. S., folio 63, 11 pp.

Reid, J. A., 1907, The ore-deposits of Copperopolis, Calaveras County, California: Econ. Geology, vol. 2, pp. 380-417.

Reid, J. A., 1908, Foothill copper belt of California: Mining and Scientific Press, vol. 96, pp. 388-393.

Rice, S. J., 1957, Asbestos: California Div. Mines Bull. 176, p. 53.

Robbins, H. R., 1916, Flotation at the Calaveras Copper mine: Mining and Scientific Press, vol. 113, no. 22, pp. 769-773.

Ross, Arnold M., 1950, Twenty-five years of building the West, the story of Calaveras Cement from 1925 to 1950. Calaveras Cement Company, San Francisco, 62 pp.

Stanford Geological Survey, 1943, Geologic map of a portion of the Foothill copper belt, Calaveras County, California: California Div. Mines Rept. 39, pl. 8.

Steffa, Donald, 1932, Gold mining and milling methods and costs at the Vallecito Western drift mine, Angels Camp, California: U. S. Bur. Mines Inf. Circ. 6612, 13 pp. (mimeo).

Stevens, H. J., 1911, The copper handbook, vol. 11, p. 1402.

Storms, W. H., 1894, Ancient channel system of Calaveras County: California Min. Bur. Rept. 12, pp. 482-492.

Storms, W. H., 1900, The Mother Lode region of California: California Min. Bur. Bull. 18, pp. 100-127.

Symons, Henry H., 1930, Mineral paint materials in California: California Div. Mines Rept. 26, pp. 152-153.

Taliaferro, N. L., 1943, Manganese deposits of the Sierra Nevada, their genesis and metamorphism: California Div. Mines Bull. 125, pp. 277-332.

Taliaferro, N. L., and Solari, A. J., 1948, Geology of the Copperopolis quadrangle, California: California Div. Mines Bull. 145, pl. 1.

Tolman, C. F., 1935, The Foothill copper belt of California: Copper Resources of the World, 16th International Geological Congress, Washington, D. C., p. 249.

Townsend, R. H., 1933, Method and cost of quarrying limestone at the plant of the Calaveras Cement Company, San Andreas, California: U. S. Bur. Mines Inf. Circ. 6610, 11 pp. (mimeo).

Trask, Parker D., et al., 1943, Manganese in California: California Div. Mines Bull. 125, pp. 106-108.

Trask, Parker D., et al., 1950, Geologic description of the manganese deposits of California: California Div. Mines Bull. 152, pp. 38-47.

Tucker, W. B., 1916, Calaveras County: California Min. Bur. Rept. 14, pp. 54-131.

Turner, H. W., 1894, Jackson folio, California: U. S. Geol. Survey Geol. Atlas of the U. S., folio 11, 6 pp.

Turner, H. W., and Ransome, F. L., 1898, Big Trees folio, California: U. S. Geol. Survey Geol. Atlas of the U. S., folio 51, 10 pp.

Turner, Mort D., 1951, Calaveras County: California Jour. Mines and Geology, vol. 47, pp. 314-316.

Utley, H. F., 1957, High-solids conditioning and flotation in processing: Pit and Quarry, October, pp. 72-74, 100.

von Bernewitz, M. W., 1913, Smelting at Campo Seco: Mining and Scientific Press, vol. 107, no. 23, pp. 897-898.

Walker, G. W., Lovering, T. G., and Stephens, H. G., 1956, Radioactive deposits in California: California Div. Mines Special Rept. 49, pp. 28-29.

Weed, W. W., 1906, Napoleon mine, Calaveras County: U. S. Geol. Survey Bull. 285, p. 106.

Whitney, J. D., 1880, The auriferous gravels of the Sierra Nevada of California: Harvard College, Mus. Comp. Zool., Mem. 6, Cambridge, Massachusetts.

Wiebelt, Frank J., and Ricker, Spangler, 1948, Penn mine slag dump and mine water, Calaveras County, California: U. S. Bur. Mines Rept. Inv. 4224, 6 pp. (mimeo).

Wiebelt, Frank J., Sanborn, W. C., Trengove, R. R., and Ricker, Spangler, 1951, Investigation of west-belt copper-zinc mines, El Dorado, Amador, Calaveras, and Mariposa Counties, California: U. S. Bur. Mines Rept. Inv. 4760, 62 pp. (mineo).

Wood, Richard C., 1955, Calaveras, the land of skulls. The Mother Lode Press, Sonora, California, 1st ed., 158 pp.

Wright, L. A., 1950, Quartz crystal: California Div. Mines Bull. 156, pp. 206-208.

Wright, L. A., 1957, Quartz crystal: California Div. Mines Bull. 176, pp. 459-462.

Young, George J., 1921, Gold mining at Carson Hill: Eng. and Min. Jour., vol. 112, pp. 725-729.

Young, George J., 1929, Drift mining at Vallecito: Eng. and Min. Jour., vol. 128, pp. 394-397.

TABULATED LISTS

The following is a tabulation of mines and mineral deposits in Calaveras County arranged in alphabetical order by commodity and by name of mine and deposit. The tabulation contains six columns. The letters and numbers in the extreme left-hand column under the heading *Map number* refer to numbers on the plate on which the property is shown. Under *Location* are section, township, and range numbers. All townships are north and the ranges east of the Mt. Diablo Base and Meridian. Also given are distances to the nearest towns. The individual listed as owner is not necessarily the sole owner, nor even a majority owner. Ownership refers to mineral rights where there is a separation of surface- and mineral-right ownership. Unless shown otherwise in parentheses following the name of owner, the date of ownership of most of the properties in this report is 1958. The names and numbers in parentheses refer to the accompanying bibliography. The first number after the author's name is the year of publication, and is separated from the page reference by a colon. References are separated from each other by semicolons. In the case of several authors, only the senior or first one is shown here. "MSP", followed by a date, colon, and number, refers to *Mining and Scientific Press*, the month, day, and year of issue, and the page.

ANTIMONY

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-293	Oro y Plata	NE¼ sec. 6, T. 3 N., R. 14 E., M.D.M.	Mary Bess Norton c/o J. C. Scoles, Murphys (1 mile west of Murphys)	Stibnite containing small amounts of gold and silver occasionally has been found in the veins.	See also Lode Gold.

ASBESTOS

D-1	Jefferson Lake (American, California, Pacific, Voorhees)	Secs. 15, 16, 21, 22, T. 1 N., R. 13 E., M.D.M.	Jefferson Lake Asbestos Company, New Orleans, Louisiana	.....	(Tucker 16:55; Logan 23b:98-99; 25:163-164; 36:226-227; Rice 57:53; herein.)
	California	.....	.....	.....	See Jefferson Lake.
	Nuner	T. 4 N., R. 13 E., M.D.M., 1 mi. N. of San Andreas	Not determined	Chrysotile asbestos in serpentine.	Undeveloped prospect (Logan 36:227).
	Pacific	.....	.....	.....	See Jefferson Lake.
	Skipper	.....	.....	.....	See Turner and Lloyd.
D-2	Turner and Lloyd (Skipper)	Sec. 15, T. 2 N., R. 12 E., M.D.M.	Max Henley et al., Copperopolis	.....	(Logan 25:164; 36:227; herein).
	Voorhees	.....	.....	.....	See Jefferson Lake.

CHROMITE

D-3	Alta	SW¼ sec. 14, NE¼ sec. 23, T. 2 N., R. 12 E., M.D.M.	C. H. Williams et al., 632 11th St., Modesto	.....	Herein.
D-1	American Asbestos	NE¼ sec. 16, T. 1 N., R. 13 E., M.D.M., 6 mi. SE of Copperopolis	American Asbestos Mining Corp., 11 W. 42d St., New York, N. Y.	Small pods and disseminated ore in serpentinized dunite and saxonite.	Active many years ago when 52 tons of ore were produced. Mined from two 25-ft. shafts. (Cater 48:41).
D-4	Bowie Estate	Secs. 9, 16, T. 1 N., R. 13 E., M.D.M.	Bowie Estate, Copperopolis	.....	(Cater 48:44-45; herein.)
D-5	Burnham	Sec. 23, T. 2 N., R. 12 E., M.D.M.	J. H. Bowie, Copperopolis (1936)	.....	Active in 1915, last worked in 1927. Developed by 40-ft. (?) shaft. (Logan 36:244; Cater 48:46-47.)
	Burnham & Wilson	.....	.....	.....	See Mayflower.
D-6	Burns & O'Neill	Sec. 9, T. 5 N., R. 13 E., M.D.M., 4 mi. SW of Railroad Flat	Not determined	.....	Some ore mined during World War I. Developed by open pit. (Cater 48:58.)
	Bushy Hill	.....	.....	.....	See Walker.
	Chaparral	.....	.....	.....	See Walker.
D-7	Clary & Langford (Porter & Spring)	Sec. 10, T. 2 N., R. 12 E., M.D.M., 5 mi. N. of Copperopolis	Not determined	Lens of massive chromite in serpentine.	Active prior to World War I and from 1916 to 1918; developed by two 50-ft. shafts and open cut. (Bradley 18:121; Logan 25:165; Cater 48:47.)
	Coffer, Trask and Stone	.....	.....	.....	See Stone.
D-8	Davis	SE¼ sec. 23, T. 2 N., R. 12 E., M.D.M., 3 mi. NE of Copperopolis	Not determined	Lenses and pods of chromite in serpentine.	Last worked in 1918. Output was 225 long tons of ore. (Bradley 18:121; Logan 25:165; Cater 48:46.)

CHROMITE—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
D-9	Dean	NW¼ sec. 9, T. 1 N., R. 13 E., M.D.M., 6 mi. NE of Copperopolis	J. H. Bowie, Copperopolis (1936)	Small pods of chromite in gray serpentine.	Active during World War I; prospected during 1930s. Produced 10 tons of 45% ore. Developed by open cuts and adit. (Logan 25:165; 36:233; Cater 48:42.)
D-10	Ellingwood	NW¼ sec. 21, T. 4 N., R. 11 E., M.D.M.	City of Stockton (1948).	.....	(Cater 48:48-49; herein.)
D-11	Ellingwood and Vogelsang	SE¼ sec. 28, T. 4 N., R. 11 E., M.D.M., 4 mi. SE of Valley Springs	William Ellingwood, Valley Springs (1948)	Massive chromite in serpentine and sheared saxonite.	Active during World War I when over 200 tons of ore were produced. Mined in open cut. (Cater 48:49.)
D-12	Fields & Stoker	SE¼ sec. 24, T. 5 N., R. 10 E., M.D.M., 5 mi. N of Valley Springs	City of Oakland (1948).	Small lenses of massive chromite in serpentinized dunite.	Active during World War I; 48 long tons of 42% Cr_2O_3 ore shipped. Developed by open pits and 25-ft. shaft. (Cater 48:51.)
D-13	Gillam	Sec. 5, T. 4 N., R. 11 E., M.D.M., 3 mi. NE of Valley Springs	Jefferson Gillam, Valley Springs (1948)	Small irregular chromite lenses in partly opalized serpentine strike N. 30° W.; ore contained 31-35% Cr_2O_3.	Active during World War I when 72 long tons of ore were produced. Developed by open cut 100 ft. long. (Cater 48:50.)
D-14	Hinch	SW¼ sec. 3, T. 2 N., R. 12 E., M.D.M., near Pool's Station, 6 mi. W of Angels Camp	J. H. Bowie, Copperopolis (1936)	Irregular NW-trending chromite lenses and pods with kammererite crop out over 150 ft. along strike.	Active in 1905 and during World War I. Chrome used for furnace linings in copper smelter. Developed by open cuts and shafts. (Bradley 18:121-122; Logan 25:165; 36:233-234; Cater 48:47-48.)
D-15	Holbrook & McGuire	NE¼ sec. 8, NW¼ sec. 9 T. 1 N., R. 13 E., M.D.M.	Bowie Estate, Copperopolis (1948)	.....	(Cater 48:42; herein.)
D-16	Liberty (McFall).	NW¼ sec. 9, T. 1 N., R. 13 E., M.D.M., at Bean Gulch 5 mi. SE of Copperopolis	Not determined.....	Chromite pods in serpentine with asbestos strike NW and dip NE.	Active during World War I when 228 long tons of 47% Cr_2O_3 ore were shipped. Developed by open pit and 2 inclined shafts 40 and 75 ft. deep. (Bradley 18:122; Cater 48:41.)
	Longton	.....	.....	.....	See Stone.
	Lowry	Sec. 30, T. 5 N., R. 11 E., M.D.M., 4 mi. N of Valley Springs	Not determined.....	.....	Active during World War I when 40% Cr_2O_3 ore was mined. Developed by open cuts and shallow shaft. (Bradley 18:122; Logan 25:165.)
D-17	Madrid (True Blue)	SW¼ sec. 21, T. 3 N., R. 13 E., M.D.M.	Adolph Genochio, Murphys	.....	(Bradley 18:123; Cater 48:56-57; herein.)
D-18	Mayflower (Burnham and Wilson)	NW¼ sec. 9, T. 1 N., R. 13 E., M.D.M.	Not determined.....	.....	(Cater 48:42; herein.)
	McFall	.....	.....	.....	See Liberty. (Bradley 18:122; Logan 25:165.)
D-19	McNamara	SW¼ sec. 32, T. 5 N., R. 11 E., M.D.M., 4 mi. NE of Valley Springs	Not determined.....	Disseminated and massive chromite in serpentine.	Active in 1942 when 6 tons of high-grade chromite was mined. (Cater 48:52.)
D-20	Neugebauer	SE¼ sec. 31, T. 5 N., R. 11 E., M.D.M., 4 mi. NE of Valley Springs	City of Oakland and Charles Neugebauer	Small irregular chromite lenses and pods in serpentine with enstatite; strike N. 25° W.	Long idle. Developed by trenches and pits. (Cater 48:50-51.)
D-21	Peri	NW¼ sec. 32, T. 2 N., R. 13 E., M.D.M., 4 mi. due E of Copperopolis	Not determined.....	Chromite lenses in serpentine near schist.	Active 1916-17. Recorded production 71 long tons of ore. (Bradley 18:122; Logan 25:165; Cater 48:45.)
	Porter & Spring	.....	.....	.....	See Clary & Langford.

CHROMITE—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
D-22	Stone (Coffer, Trask & Stone, Longton)	SE¼ sec. 23, SW¼ sec. 24, T. 2 N., R. 12 E., M.D.M., 3 mi. NE of Copperopolis	Charles Stone, Copperopolis (1945)	Chromite lenses as much as 3 ft. thick strike N. 25° W.; also some disseminated chromite; in serpentine.	Last active during World War I; output 92 long tons of ore (Cater 48:46.)
	True Blue				See Madrid. (Bradley 18:123; Logan 25:165.)
D-23	Valenti	SW¼ sec. 2, T. 3 N., R. 13 E., M.D.M., 3 mi. due W of Murphys	Charles Valenti, Murphys (1948)	A 1- to 4-ft. massive chromite lens in sheared serpentine strikes N. 60° E.; estimated to contain 200 tons of 28% chromic oxide ore.	Prospected during 1930s and 1940s; developed by trenches (Cater 48:57).
D-24	Vogelsang	SW¼ sec. 34, T. 4 N., R. 11 E., M.D.M., 5 mi. SE of Valley Springs	G. D. Vogelsang, Valley Springs (1948)	Lenses and pods of chromite are found for 230 ft. along NW-striking shear zone in serpentine and pyroxenite.	Active during World War I when 229 long tons of 43-46% Cr_2O_3 ore was produced. Developed by open cuts. (Bradley 18:123; Logan 25:165; Cater 48:48.)
D-25	Walker (Bushy Hill, Chaparral)	Sec. 15, T. 2 N., R. 12 E., M.D.M.	B. C. Creswell (1948)		(Bradley 18:123; Cater 48:47; herein.)
D-26	Ward & Lyons	Sec. 24, T. 5 N., R. 10 E., M.D.M., 5 mi. N of Valley Springs by Pardee Reservoir	City of Oakland (1948)	N-trending lens of chromite as much as 14 ft. thick and 50 ft. long, in saxonite.	Active during World War I when 1,299 long tons was produced. Mined in open cut. (Bradley 18:217; Logan 25:165; Cater 48:51-52.)

CLAY

	California Pottery Co.				See Valley Springs pit.
D-27	Helisma Fireclay (Houts)	Sec. 20, T. 4 N., R. 10 E., M.D.M., ¼ mi. N of Burson	Not determined	Bed 8 to 15 ft. thick of blue and greenish lone fire clay with limonitic streaks and sand.	Long idle. Developed by two open pits. (Boalich 20:43; Logan 25:167; Dietrich 28:69-70, 305.)
	Houts				See Helisma Fireclay.
D-28	Nigger Hill	Sec. 11, T. 4 N., R. 10 E., M.D.M., 3 mi. N of Valley Springs	Not determined	A body of white-burning kaolinized schist 15 ft. thick, suitable for use as tile filler.	Long idle. Developed by 250-ft. adit. (Dietrich 28:68, 263.)
	Penn	E½ sec. 4, T. 4 N., R. 10 E., M.D.M., at Penn copper-zinc mine	New Penn Mines, Inc., 70 Pine St., New York 5, N. Y.	Kaolinized sericite schist overlying copper ore.	During operations of Penn copper smelter, 1899-1919, clay was used as refractory; has low plasticity and strength. (Aubury 06:211; Boalich 20:43; Logan 25:167; Dietrich 28:70, 316.)
D-29	Snyder	SW¼ sec. 6, NW¼ sec. 7, T. 4 N., R. 11 E.; NE¼ sec. 12, T. 4 N., R. 10 E., M.D.M., 1½ to 2 mi. N of Valley Springs	John Snyder, Valley Springs	lone clay	Pacific Clay Products leased property, mined about 7,000 tons of red clay per year in mid-1950s, for use in manufacturing heavy clay products at Stockton plant. Large stockpiles of crude red and white clays prepared at two pits.
	Texas Mining Co.	T. 4 N., R. 10 E., M.D.M., 2 mi. N of Valley Springs	Not determined	Undeveloped deposit of lone sandy fire clay and kaolinized sericite schist.	(Dietrich 28-70, 263.)
D-30	Valley Springs Pit	S½ sec. 13, T. 4 N., R. 10 E., M.D.M., at Valley Springs	California Pottery Co., Niles		(Aubury 08:212; Tucker 16:234; Boalich 20:43-44; Logan 25:167; Dietrich 28:68-69, 337; Logan 36:234; herein.)

COBALT

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and reference
	Casey and Bach	Sec. 7, T. 5 N., R. 12 E., M.D.M., 1 mi. E of Mokelumne Hill	Not determined.....	Asbolite, a cobalt-bearing wad, occurs in 16-inch quartz vein which pinches out at 6-ft. depth.	Prospect developed by shallow shaft. (Logan 25:142.)
	Johnson.....	.....	.....	.....	See Mar John.
B-249	Mar John (Johnson)	W½ sec. 21, T. 4 N., R. 14 E., M.D.M., 4 mi. NE of Murphys by Indian Creek	Louis Domenghini, and Lester Canevaro, Mountain Ranch	Smaltite is found with arsenopyrite in a vein a few inches thick in mica schist and quartzite.	Gold mine; prospected for cobalt from 1923-30. A few tons of ore were mined but apparently never marketed. Developed by open cut and 175-ft. shaft. See also Lode Gold. (Logan 24:4, 178; 25:142; 36:271-274.)

COPPER

	Bell Prince.....	Sec. 4, T. 4 N., R. 10 E., M.D.M., in vicinity of Penn mine ½ mi. W of Campo Seco	Not determined.....	Chalcopyrite and pyrite in greenstone.	Prospected years ago through 21-, 61-, and 100-ft. shafts. (Tucker 16:56; Eric 48:218.)
	Blue Jay.....	.....	.....	.....	See Penn.
	Bonanza.....	Secs. 27, 34, T. 5 N., R. 12 E., M.D.M., near Murray Creek, 5 miles NE of San Andreas	Not determined	Vein in Calaveras schist.....	Active prior to 1914 with some recorded production. (Eric 48: 218.)
D-31	Bund.....	W½ sec. 12, T. 3 N., R. 12 E., M.D.M., on Donovan Ridge, 5 mi. NW of Angels Camp	Not determined	Vein at serpentine-amphibolite schist contact.	Prospected years ago. Developed by caved 50-, 75-, and 108-ft. shafts. (Tucker 16:56; Eric 48: 218; Clark 54:21.)
	Calaveras Copper Co.	.....	.....	.....	See Copperopolis mines.
	Caledonian.....	Sec. 4, T. 3 N., R. 11 E., M.D.M., 4 mi. SE of Valley Springs	Not determined.....	Chalcopyrite and pyrite in greenstone.	Active during 1860s. Developed by 250-ft. shaft. (Aubury 05: 198; 08:245; Eric 48:218.)
	Campo Seco.....	.....	.....	.....	See Penn. (Tucker 15:56-57; Eric 48:218.)
D-32	Clark.....	NW¼ sec. 18, T. 7 N., R. 16 E., M.D.M., near crest of ridge 1½ mi. S of Garnet Hill	Moore Creek Mining Co., P.O. Box 78, Pioneer	Small discontinuous tactite bodies in granodiorite gneiss contain small amounts of scheelite and chalcopyrite.	Tungsten-copper prospect. Prospected for copper during World War I, later for tungsten. Developed by shallow open cuts. See also under Tungsten.
D-33	Clothier and Cameron	Sec. 2, T. 2 N., R. 12 E., M.D.M., 5 mi. W of Angels Camp	Not determined.....	An 18-in. vein of pyrite with chalcopyrite in greenstone.	Prospected early 1900s. Developed by 35-ft. shaft. (Aubury 08:245; Eric 48:219.)
D-34	Collier.....	W½ sec. 24, T. 1 N., R. 11 E., M.D.M., 1½ mi. SE of Telegraph City	Mrs. Violet Likens, P.O. Box 31, Belvedere	.....	(MSP 11-9-63:02; Aubury 05: 197; 08:244; Tucker 16:57; Logan 36:301; Heyl 48:124-125; herein.)
	Constellation....	.....	.....	.....	See Penn. (Aubury 05:196; 08: 244; Tucker 16:57.)
	Copper Hill.....	.....	.....	.....	See Penn.
D-35 D-42 D-49	Copperopolis mines: includes Empire, Keystone-Union, and North Keystone mines	Secs. 2, 3, T. 1 N., R. 12 E.; sec. 34, T. 2 N., R. 12 E., M.D.M., in vicinity of Copperopolis	Calaveras Consolidated Mining Co., 801 Bank of America Bldg., San Jose	.....	(Browne 68:211-212; Hanks 84: 148; Irelan 88:150-152; Preston 93:167-168; Storms 00: 126; Aubury 05:189-194; Knopf 06:418-422; Lang 07: 1007-1008; Reid 07; Aubury 08:229-238; Forstner 08:746; Tucker 15:62-63; Logan 21: 420; 23:18; 24:4; 24a:76-80; 25:143; Tolman 35:247; Averill 43:72, 313-314; Heyl 45; 48:93-100; herein.)

COPPER—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Diamond J				See Telegraph.
	Eagle				See Quail Hill.
D-37	Empire				See Copperopolis mines.
	Excelsior				See Star and Excelsior.
D-161	Garnet Hill	Secs. 6, 7, T. 7 N., R. 16 E., M.D.M., at Garnet Hill	North American Tungsten, Inc., Gazette Bldg., Reno, Nevada	Tactite with scheelite and disseminated chalcopyrite.	Tungsten mine from which by-product copper has been recovered. See Tungsten.
	Goat Ranch				See Nassau.
D-36	Gopher Hill	NE¼ sec. 10, T. 1 N., R. 11 E., M.D.M., by Buckhorn Creek, 1½ mi. N of Telegraph City	H. L. Donner, Milton	Zone of pyritized greenstone 20 ft. thick with quartz stringers strikes NW and dips NE; gold ore mined in 1930s yielded $9 per ton.	Copper and gold mine. Active 1921, 1934-36; explored by Calaveras Cons. Copper Co. in 1943; surface recently prospected. Developed by open 84-ft. shaft with levels at 40 and 80 ft., and open cut. See also under Lode Gold. (Logan 36:262; Eric 48:220.)
	Happy Jack				See Penn.
	Hecla				See Penn.
	Holmes	Secs. 2, 11, T. 4 N., R. 10 E., M.D.M., 1 mi. SE of Campo Seco	Not determined	Vein with abundant sulfides in amphibolite schist strikes W and dips S.	Long idle. Developed by 365-ft. drift adit. (Tucker 16:57; Eric 48:220.)
	Jackson McCarty				See Copperopolis mines. (Aubury 05:198; 08:244; Eric 48:220.)
	Josephine (Old Mountain Top)	SE¼ sec. 8, T. 1 N., R. 13 E., M.D.M., 4 mi. SE of Copperopolis	Not determined	A 4- to 5-ft. vein in greenstone with chalcopyrite and and pyrite.	Active in 1864. Developed by 40-ft. shaft. (Aubury 05:197; 08:244; Eric 48:220.)
D-37	Keystone				See Copperopolis mines.
	Keystone-Union				See Copperopolis mines.
	Libbie and Welch				See Lightner.
D-38	Lightner (Libbie and Welch, Welch and Star)	NW¼ sec. 18, T. 1 N., R. 13 E., M.D.M., on W slope of Lightner Peak, 3 mi. SE of Copperopolis	Charlotte Elasser, Copperopolis (1948)	Vein, with ore bodies as much as 20 ft. in thickness, in green schist, strikes N. 45° W. and dips NE; capped by gossan; large dump.	Long idle. Developed by open 150-ft. inclined shaft and 250-ft. crosscut adit on 90-ft. level; two other shafts to SW. (Storms 00:126; Tucker 16:63-64; Eric 48:221.)
D-39	Little Quail Hill	NW¼ sec. 24, T. 1 N., R. 11 E., M.D.M., 6 mi. SW of Copperopolis and just N of Collier mine	Not determined	Some sulfides in greenstone.	U. S. Bureau of Mines drilled 2 holes about 900 ft. NW of Collier mine, on Little Quail Hill mine. Holes disclosed presence of zinc, copper, gold, and silver, but no commercial ore was intersected. (Jenkins 43: 560, pl. 8; Heyl 48:125.)
	Meteor				See Penn. (Aubury 05:196; 08:242.)
	Missenger ranch	T. 4 N., R. 10 E., M.D.M., 2½ mi. N of Valley Springs	Not determined	Vein with abundant sulfides.	Long idle. Developed by 400-ft. shaft. (Aubury 05:198.)
D-162	Moore Creek	Sec. 7, T. 7 N., R. 16 E., M.D.M., on S side Moore Creek S of Garnet Hill	Moore Creek Mining Co., P.O. Box 78, Pioneer	Tactite with scheelite and coarse disseminated aggregates of chalcopyrite.	Tungsten-molybdenum mine from which by-product copper has been recovered. See also Tungsten.

COPPER—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Mountain Top				See Josephine.
D-40	Napoleon	NE¼ sec. 23, T. 1 N., R. 11 E., M.D.M.	E. A. Nutter et al., P.O. Box 187, Saratoga		(MSP 12/29/62:2; Aubury 05: 196-197; Knopf 06:422-423; Weed 06:106; Aubury 08: 242-243; Forstner 08:747; Tucker 15:58; Averill 43:72, 314; Heyl 48:123-124; herein.)
D-41	Nassau (Pool) (includes Goat Ranch and Goat Ranch Extension)	NE¼ sec. 9, NW¼ sec. 10, T. 2 N., R. 12 E., M.D.M.	C. J. Tiscornia, San Andreas		(Aubury 05:198; 08:245; Forstner 08:744, 747; Tucker 15: 58-59; Weed 16:805-806; 18:578; Eric 48:221; herein.)
D-42	North Keystone				See Copperopolis mines.
D-43	Penn (Blue Jay, Campo Seco, Constellation, Copper Hill, Happy Jack, Hecla, Little Satellite, Meteor, Penn Chemical Works, Satellite, West Constellation)	Secs. 3, 4, T. 4 N., R. 10 E., sec. 33, T. 5 N., R. 10 E., M.D.M.	New Penn Mines, Inc., 123 William St., New York 38, N. Y. Constellation Mining Co., c/o Harriet B. Minahen, 4715 Opal Cliff Dr., Santa Cruz John Ponzetto, 2831 North E St., Stockton		(Browne 68:212; Hanks 84:148-151; Irelan 88:152-156; Crawford 96:57; Aubury 05:194-196; Knopf 06:415-418; Aubury 08:238-242; Forstner 08: 746; Tucker 16:59-62; Logan 21:420; 26:374; Tolman 35: 247-250; Averill 43:552-555; Heyl 48:61-84; Eric 48:20; Wiebelt 48:1-6; O'Brien 50: 304; Turner 51:316; Mining World 52:21-24; herein.)
	Penn Chemical Works				See Penn. (Irelan 88:152-155; Aubury 05:194-196; 08:238-242.)
	Pool				See Nassau.
D-44	Quail Hill (Eagle)	S½ sec. 3, N½ sec. 10, T. 1 N., R. 11 E., M.D.M.	G. Ivan Smith, 4333 E. Florence Ave., Bell (1948)		(MSP 8/17/63:1; Am. Jour. Min. 67:308; Aubury 05:197; Tucker 15:57, 62; Averill 43: 314-315; Eric 48:222; Heyl 48:112-122; herein.)
	Satellite				See Penn. (Storms 00:125; Aubury 08:242; Logan 36:298; Eric 48:222.)
D-45	Shumate	NW¼ sec. 25, T. 1 N., R. 11 E., 2 mi. S of Telegraph City and ¼ mi. S of Star-Excelsior mine	J. J. Malspina, Vallecito	Vein of pyritized and kaolinized greenstone with chalcopyrite strikes NW and dips NE.	Active during World War I when $8,000 produced; developed by shallow shaft; shaft dewatered in 1943. (Eric 48:223.)
D-46	Star and Excelsior	SW¼ sec. 24, NW¼ sec. 25, T. 1 N., R. 11E., M.D.M.	H. L. Donner, Milton		(Aubury 05:197; 08:244; Tucker 16:62; Heyl 48:125-126; herein.)
D-47	Table Mountain	NE¼ sec. 20, T. 1 N., R. 13 E., M.D.M., 5 mi. SE of Copperopolis	Not determined	Massive pyrite with chalcopyrite in greenstone.	Active 1863-65. Table Mountain Copper Co. sank two shafts, 45 and 140 ft. deep, and ran a few hundred feet of drifts. Total recorded production 85 tons of ore averaging 20% copper. (MSP 10/26/63: 2; 6/18/64:441; 5/13/65: 289; 11/9/65:275.)
D-48	Telegraph (Diamond J)	SE¼ sec. 26, T. 1 N., R. 11 E., M.D.M., 2 mi. S of Telegraph City	J. J. Malspina, Vallecito	Vein of pyritic greenstone with chalcopyrite strikes NW and dips NE.	Production 1865, 1914. Shaft 120 ft. deep. (Tucker 16:57; Eric 48:223.)
D-49	Union				See Copperopolis mines.
	Welch and Star				See Lightner.

LODE GOLD

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-1	Able	SW¼ sec. 20, T. 3 N., R. 12 E., M.D.M., near Bear Creek, 8 mi. W of Angels Camp	Not determined	Vein in greenstone strikes NW and dips NE.	Long idle. Developed by shaft.
	Addie	Sec. 22, T. 5 N., R. 11 E., M.D.M., 1 mi. NE of Paloma	Not determined	A 12-ft. vein in slate and gneiss strikes NW and dips NE; ore is free milling.	Long idle. Developed by 200-ft. adit. (Kerr 00.)
B-2	Adelaide	SE¼ sec. 24, T. 2 N., R. 13 E., M.D.M., on S slope Carson Hill ½ mi. E. of Melones	Fred G. Stevenot, 300 Montgomery St., San Francisco	Zone of quartz, graphite, mariposite, and talc 15 ft. wide strikes N. 30° W. and dips 80° NE.	Active 1890-93; consolidated with Melones mine in 1895. Developed by 100-ft. vertical shaft. See also Carson Hill. (Brown 90:57; Fairbanks 90:57; MSP 9/2/93:157; Crawford 96:96; Kerr 00; Tucker 16:66.)
B-3	Adelia	NE¼ sec. 5, T. 2 N., R. 13 E., M.D.M., 1½ mi. W of Angels Camp	George M. Tryon, Angels Camp (1936).	On Mother Lode. Vein with greenstone hanging wall and phyllite footwall strikes N. 45° W. and dips 75° NE.	Long idle. Developed by shaft. (Eric, Stromquist, and Swinney 55:pl. 1.)
B-4	Admiral Dewey	Sec. 7, T. 4 N., R. 14 E., M.D.M., by O'Neil's Creek, 1 mi. NW of Sheep Ranch	Not determined	Vein in mica schist strikes NW and dips NE; abundant sulfides.	Long idle; developed by adit.
	Aetna				See McKisson.
	Afterthought (Norrie)	Sec. 26, T. 6 N., R. 13 E., M.D.M., on ridge S of Little Spruce Creek near Railroad Flat	Ruby Taylor, Railroad Flat	Vein in slate and schist strikes N.	Active 1901. Developed by 140-ft. shaft and 300 ft. adit. See also Petticoat. (MSP 11/2/01: 186; Tucker 16:68.)
	Aladin Gold Mining Company				See Bright Star.
B-5	Alameda	NE¼ sec. 23, T. 4 N., R. 13 E., M.D.M., near San Antonio Creek 2½ mi. NE of Fricot School	Wm. N. Nuner, San Andreas (1936)	A 1- to 4-ft. quartz vein in black slate strikes NW and dips NE.	Unpatented claim. Active around 1896. Developed by 115-ft. drift adit. (Crawford 96:96; Kerr 00.)
B-6	Alaska	NW¼ sec. 12, T. 6 N., R. 13 E., M.D.M., 2 mi. SE of West Point	Not determined	A 2-ft. vein in granodiorite strikes N. 15° W. and dips 75° SW; abundant sulfides.	Long idle. Developed by 90-ft. shaft and drift. (Logan 23a:21.)
	Albany	Sec. 28, T. 4 N., R. 13 E., M.D.M., near Fricot School	Not determined	A 1½-ft. vein in slate and mica schist strikes W and dips N.	Long idle. Developed by 500-ft. adit. (Kerr 00.)
B-7	Alexander (Alexandria, Pamona)	Secs. 31 and 32, T. 6 N., R. 13 E., M.D.M., on ridge 1½ mi. S of Glencoe	Nicola Mondani Estate, c/o Ernest Juri, Mokelumne Hill	A 10-ft. vein with abundant sulfides strikes N. Slate and schist country rock.	Active 1867-71. Developed by 870-ft. adit and 50-ft. shaft. Ore treated in 10-stamp mill. (MSP 4/27/67:262; 11/28/-68:342; 3/18/71:163; Tucker 16:68.)
	Alexandria				See Alexander.
B-8	Alliance	Sec. 1, T. 6 N., R. 13 E., M.D.M.			
	Allison				See Garner.
	Allison-Merrimac	Secs. 14, 15, 23, T. 2 N., R. 13 E., M.D.M., by Carson Creek, 1 mi. W of Carson Hill	Eugene Allison, 1411 S. Hunter St., Stockton (1936)	On Mother Lode. Vein zone as much as 45 ft. in thickness strikes N and dips E.	Active 1893-1904. Developed by 2 adits and open cut. Ore treated in Carson Creek mill. (MSP 6/10/93:358; Crawford 96:96; MSP 4/16/04:272.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-9	Alpha	Sec. 31, T. 6 N., R. 13 E., M.D.M.			
B-10	Alpha and Omega (Greek, Omega) Fler de Ora, Matilda, Omega, Stramatis mines	S½ sec. 21, T. 5 N., R. 13 E., M.D.M., on ridge between Jesus Maria and Esperanza Creeks	Loring F. Bennett and Alice C. Rynn, 6700 Balboa Blvd., Van Nuys	A 1½-ft. vein associated with dikes strikes NW and dips NE; mica schist and slate country rock. Ore reported to have yielded $19 to $34 per ton.	Active in 1877, early 1890s, and 1913-14. Developed by several shafts, one 175 ft. deep. Ore treated in 5-stamp mill. (MSP 9/1/77:136; 8/15/91: 98; Kerr 00; Storms 00:123; Tucker 16:68.)
B-11	Alpine	E½ sec. 20 and W½ sec. 21, T. 4 N., R. 13 E., M.D.M., in Old Gulch 3 mi. SW of Mountain Ranch	Not determined	A 2- to 7-ft. vein containing pyrite, galena, and sphalerite strikes N. 68° W. and dips 80° NE; slate hanging wall, mica schist footwall. Ore yielded as much as $125 per ton.	Unpatented claim. Active 1896-1901. Developed by 90- and 150-ft. drift adits. (Crawford 96:96; Kerr 00; MSP 7/6/01: 8; Tucker 16:68.)
	Alta				See Alto.
	Alta No. 3	Sec. 20, T. 4 N., R. 14 E., M.D.M., 3½ mi. N of Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N.	Long idle.
B-12	Altaville	SW¼ sec. 28, T. 3 N., R. 13 E., M.D.M., in Altaville by junction State Highways 8 and 49	Ida May Prince, c/o Mrs. E. Eickhoff, 62 Santa Clara Ave., Oakland 10	On Mother Lode. Quartz vein in green schist strikes NW and dips 75° NE.	Active 1860s and 1890s. Developed by 400-ft. shaft. Ore treated in 8-stamp mill. (MSP 6/23/66; Crawford 96:97; Kerr 00.)
B-13	Alto (Alta)	On Rancho del Rio in Scorpion Gulch 6 mi. SSE of Copperopolis	Gaylord estate, c/o G. S. Gaylord, 475 Huntington Dr., San Marino 9		(MSP 11/16/01:207; 7/7/06: 24; Tucker 16:68; Lowell 16: 629; herein.)
	Amador Columbia				See Calaveras Columbus.
B-14	Ambrosia	N½ sec. 28, T. 4 N., R. 12 E., by State Highway 49, 2 mi SE of San Andreas	John Guttinger, San Andreas	Vein in schist and slate strikes NW and dips NE. On Mother Lode.	Long idle. Developed by shaft. (Kerr 00; Logan 36:292.)
B-15	American Eagle	NW¼ sec. 9, T. 5 N., R. 13 E., M.D.M., 3 mi. SW of Railroad Flat	Not determined	A 1-ft. gold-bearing quartz vein strikes E and dips 65° N, slate and mica schist country rock.	Active around 1914. Developed by 500-, 80-, and 150-ft. crosscut adits and drifts. Ore treated in 2-stamp mill. (Tucker 16:68.)
	Anderson Flat				See Gold Star.
B-16	Angels (Big, Billings, Doc Hill, Fox, McCormick, Minnie Hennesay, Oneida, Potter, Southwell, Valentine Jr.)	NE¼ sec. 33, T. 3 N., R. 13 E., M.D.M.	Utica Mines, Inc., 220 Montgomery St., San Francisco		(MSP 9/22/66:182; 1/30/69: 70; 2/24/72:196; 2/11/82: 92; Irelan 87:29; 88:141-43; MSP 11/23/89:394; Brown 90:150; Fairbanks 90:61; Crawford 94:89; 96:97; Kerr 00; Storms 00:109; MSP 11/-28/03:358; Tucker 16:68-69; Logan 21:420; 35:127-28; herein.)
B-17	Angels Deep (Brown, Hale, Johnson, Pat, Pioneer, Ryland Consolidated, Smythe, Suffolk)	W½ sec. 33, T. 3 N., R. 13 E., M.D.M.	Utica Mines, Inc. et al., 220 Montgomery St., San Francisco		(MSP 4/27/18:593; 4/9/21: 507; Logan 21:420-21; Hamilton 22:25; Logan 23b:97-98; 35:128; 36:239-240; herein.)
	Angels Camp Deep Mining Company				See Angels Deep.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Anglo-Saxon				See Ilex.
	Annapolis (Wilson)	T. 7 N., R. 13 E., M.D.M., 1¼ mi. NW of West Point	A. R. Wilson, West Point (1936)	Quartz vein in granodiorite strikes N and dips 45° W.	Prospected 1934-35. Developed by 100-ft. inclined shaft with drifts on 100-ft. level extending 80 ft. N and 80 ft. S. (Logan 36:240.)
	Annie	Secs. 20, 29, T. 2 N., R. 13 E., M.D.M.; 1 mi. NW of Altaville	Not determined	A 2- to 4-ft. vein in greenstone strikes NW and dips NE.	Active in early 1900s; prospected in 1920s. Developed by shallow shaft. (Kerr 00.)
	Apex				See Ford.
	Ariel	Sec. 5, T. 5 N., R. 12 E., M.D.M., on ridge S of Mokelumne River 2 mi. NE of Mokelumne Hill	Not determined	Series of N-S and E-W veins.	Discovered 1889, active again 1909. Developed by 600-ft. adit. (MSP 9/14/89:204; 12/11/09:803; Tucker 16:69.)
	Arizona				See Dragone.
	Arm & Hammer	Near West Point	John Eaph, West Point (1946)	N-trending vein.	Developed by 200-ft. drift and 60-ft. shaft. (U. S. Bureau of Mines records.)
	Arthur (French)	Secs. 6, 7, T. 6 N., R. 14 E., M.D.M., on ridge W of Bald Mountain 4 mi. E of West Point	Not determined	Vein in granodiorite strikes N.	Worked prior to 1914. Developed by 70-ft. shaft. (Tucker 16:69.)
B-18	Auction	Sec. 5, T. 6 N., R. 13 E., M.D.M.			
B-19	Austrian	SW¼ sec. 6, T. 6 N., R. 14 E., M.D.M., 2 mi. SE of West Point	Not determined	A 1- to 3-ft. vein in granodiorite strikes N; sulfides abundant.	Active 1864-77, 1889-94, 1910; prospected 1930s. Developed by 115-ft. shaft now caved. (MSP 2/13/64:98; 7/21/77:37; 5/28/10:811.)
B-20	A. V. G. (Golden Sherer)	SE¼ sec. 35, T. 6 N., R. 13 E., M.D.M.	Mrs. Amelia Stotts, R.F.D. Box 35, Mokelumne Hill		(Minerals Yearbook 35; Logan 36:261-62; herein.)
B-21	Bachman (Backman)	NW¼ sec. 11, NE¼ sec. 10, T. 3 N., R. 12 E., M.D.M., at Fourth Crossing and just E of Highway 49	Narciso F. Ponte, San Andreas	On Mother Lode. Several gold quartz veins in phyllite and slate strike NW and dip NE; one as much as 30 ft. thick.	Active sometime between 1894 and 1914, and intermittently in 1920s and 1930s; small production. Developed by 478-, 305-, and 70-ft. shafts. (Kerr 00; Tucker 16:69; Logan 25:144; 35:143.)
	Backman				See Bachman.
B-22	Bald Eagle	NW¼ sec. 23, T. 6 N., R. 13 E., M.D.M., on ridge S of S Fork Mokelumne River 1¾ mi. N of Railroad Flat	Alma Investment Co., 1257 Shrader St., San Francisco 17	A 1½- to 13-ft. vein in mica schist strikes N. 30° E. and has a nearly vertical dip.	Active in 1870s, 1880s, and 1890s; ore was treated in 10-stamp mill. According to newspaper clippings mine was prospected around 1925 and again in 1934-35. Developed by adits and a winze. (MSP 7/9/70:28; 8/15/91:98.)
	Bald Hill				See Bruner.
	Baltimore				See Garner.
B-23	Banner (Grasshopper)	SE¼ sec. 20, T. 6 N., R. 13 E., M.D.M., in Glencoe	J. S. Wright, Berkeley (1936)	Main vein strikes N, dips almost vertically, intersects W-striking and N-dipping vein 200 ft. N of shaft; country rock is granodiorite and mica schist.	Active 1870s, 1887, and middle 1930s. Developed by 200-ft. inclined shaft with levels at 80, 140, and 200 ft. (MSP 10/19/-72:244; 5/6/76:293; 1/29/-87:68; Crawford 96:97; Kerr 00; Tucker 16:69; Logan 36:240-41.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Banner				See Mayflower.
	Banner (North Star)	Sec. 23, T. 5 N., R. 13 E., M.D.M., 4 mi. NE of Mountain Ranch	Not determined	Gold-bearing quartz vein strikes NW, dips E, and averages 10 ft. in width.	Long idle. Developed by 45-ft. vertical shaft. (Kerr 00; Logan 36:241.)
B-24	Bartola, Bartola Annex, Excelsior	W½ sec. 1, T. 6 N., R. 13 E., M.D.M., at Bummerville 1 mi. E of West Point	Joseph L. Kirk, 1109 N. Orange, Azusa	A 1- to 2½-ft. vein in granodiorite strikes N. Ore yielded as much as $60 per ton; abundant sulfides.	Active prior to and during the 1870s. Developed by 135-ft. shaft. (MSP 7/13/72:20; 10/-11/73:229; Kerr 00; Tucker 16:69.)
B-25	Basco	N½ sec. 33, T. 4 N., R. 13 E., M.D.M., 1 mi. SE Fricot School by San Antonio Creek	J. A. Dasso et al., 136 Madeline Drive, Monrovia	Vein in graphitic schist and slate strikes W and dips 55° N.	Long idle. Developed by open 200-ft. N. crosscut adit and connecting 100-ft. shaft. (Kerr 00; Tucker 16:70.)
B-26	Bear Mountain	NW¼ sec. 33, T. 3 N., R. 12 E., M.D.M., 6 mi. due W of Angels Camp	C. J. Tiscornia, San Andreas	Vein in greenstone strikes NW, dips NE.	Active 1932-33, 1940. Developed by shallow shaft. (U. S. Bureau of Mines records.)
B-27	Beatrice	NE¼ sec. 1, T. 3 N., R. 13 E., M.D.M., 1 mi. W of Murphys	C. F. Fisk and E. J. Harp, Murphys	Gold-bearing quartz vein in mica schist strikes E, dips 70° N.	Active 1880s and 1890s. Developed by 350- and 150-ft. shafts, and 1,200-ft. connecting crosscut adit. (MSP 2/4/88:67; Kerr 00; Tucker 16:70.)
	Beckley	Sec. 20, T. 3 N., R. 11 E., M.D.M., 6 mi. due E of Jenny Lind	Elizabeth Stalker et al., 15600 Cannon Drive, Los Gatos	A 2½-ft. vein in slate strikes NW; abundant sulfides.	Long idle. Developed by 70-ft. shaft. (Kerr 00.)
	Belfast	Sec. 34, T. 5 N., R. 13 E., M.D.M., 1 mi. NE of Mountain Ranch	Not determined	A 4-ft. vein in slate strikes W and dips N; sulfides abundant.	Long idle. Developed by 150-ft. shaft and 100-ft. adit. (Kerr 00.)
B-28	Belle	E½ sec. 23, T. 2 N., R. 13 E., M.D.M., by Carson Creek, 1 mi. due W of Melones	Not determined	On Mother Lode. Three veins 4 to 55 ft. wide strike NW and dip NE; diorite hanging wall, slate footwall; free milling ore with abundant sulfides.	Active early 1890s. Developed by 300-ft. crosscut adit and drifts. (Crawford 94:90; 96:97; Kerr 00.)
	Belmont-Osborne				See Osborne.
B-29	Bence (Tellurium)	E½ sec. 34, T. 4 N., R. 13 E., M.D.M.	Clarence Hengen et al., c/o Harry Hengen, San Andreas		(MSP 4/15/65:227; Crawford 96:97; Kerr 00; Logan 25:145; 36:242; herein.)
B-30	Bendigo	Sec. 30, T. 6 N., R. 13 E., M.D.M.			
	Ben Hur	Sec. 7, T. 4 N., R. 13 E., M.D.M., 1 mi. W of Mountain Ranch	Not determined	Two veins in slate strike NW and dip NE.	Long idle. Developed by 115-ft. adit. (Kerr 00.)
B-31	Benson	S½ sec. 30, T. 3 N., R. 13 E., M.D.M.	M. B. and J. E. Oliver et al., 135 East Magnolia St., Stockton		(MSP 8/27/04:144; Logan 36: 247; herein.)
	Big				See Angels.
	Big Bonanza				See Oriole.
B-32	Big Four	W½ sec. 11, T. 3 N., R. 12 E., M.D.M., ½ mi. S of Fourth Crossing and just E of Highway 49	N. F. Ponte, San Andreas	On Mother Lode. Three veins in slate and phyllite strike NW and dip NE.	Long idle. Developed by 136-ft. shaft now caved, and open cut. (Kerr 00; Tucker 16:70.)
B-33	Big Horn	SE¼ sec. 29, T. 4 N., R. 14 E., M.D.M., near San Domingo Creek 2½ mi. NW of Murphys	Alma Lenore Francis, c/o Alma Francis Fields, Star Route, Sandy, Oregon	Vein of dark blue quartz in mica schist strikes W; contains free gold and abundant sulfides.	Active prior to and in 1899. Developed by 400-ft. upper and 420-ft. lower drift adits and 75-ft. winze in lower adit. (MSP 6/3/99:590; Crawford 96:97-98; Tucker 16:70; Logan 36: 243.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Big Pine				See Easyz Bird.
B-34	Big Seven	NE¼ sec. 27, T. 2 N., R. 12 E., M.D.M., in Christian Gulch, 2 mi. N of Copperopolis	F. H. Lieginger et al., 21 West Monterey Ave., Stockton	A mineralized zone as much as 300 ft. wide strikes NW and dips NE; contains free gold with galena, pyrite, and sphalerite in calcite, barite, quartz, and sericite schist.	Active prior to and during 1936. Developed by 110-ft. inclined shaft with levels at 50 and 100 ft. and 80-ft. S adit. (Kerr 00; Logan and Franke 36:243.)
B-35	Big Spring (Graham)	SE¼ sec. 3, T. 2 N., R. 13 E., M.D.M.	Anna L. Sloan et al., Vallecito		(Kerr 00; Tucker 16:70; Logan 35:128; Julihn 38:129; herein.)
	Billings				See Angels.
B-36	Billy Williams	SE¼ sec. 26, T. 7 N., R. 13 E., M.D.M., at Skull Flat, 2 mi. NE of West Point	James J. Rowe et al., 203 Pleasant St., Grass Valley	A 1- to 2-ft. vein in granodiorite strikes NW and dips SW; abundant sulfides.	Active 1870s, 1880s, 1914, and 1931. Developed by 200-ft. crosscut adit and 200 ft. of drifts. (MSP 3/9/72:146; 8/-27/81:132; Kerr 00; Tucker 16:70.)
B-37	Birney	NW¼ sec. 26, T. 3 N., R. 14 E., M.D.M., just N of Highway 4, 1¼ mi. N of Angels Camp	D. C. Demarest, 1865 Yosemite Rd., Berkeley	A number of quartz veins, in a zone 200 ft. wide in chlorite and talc schist, contain as much as 4 percent auriferous pyrite.	Active in the 1890s. Developed by 130-ft. shaft. Ore treated in 10-stamp mill. (Crawford 94:90; 96:98; Kerr 00.)
	Bisbee	T. 3 N., R. 13 E., M.D.M., 1½ mi. W of Angels Camp	Not determined	A number of NW-striking and NE-dipping quartz veins in amphibolite schist.	Active 1860s, 1870s and 1896. Ore treated in 5-stamp mill. (MSP 11/30/72:340; 10/-20/94:250; Crawford 96:98.)
B-38	Bismark	SE¼ sec. 29, T. 4 N., R. 12 E., M.D.M., ¼ mi. NE of Kentucky House	Not determined	On Mother Lode. A 2- to 4-ft. vein with slate hanging wall and schist footwall strikes N. 24° W. and dips NE; ore yielded as much as $40 per ton.	Active around 1877 to 1884 and 1900. Developed by 550-ft. adit. (MSP 9/1/77:133; 7/-19/84:40; Kerr 00.)
	Black Bart	Sec. 29 or 30, T. 2 N., R. 13 E., M.D.M., 6 mi. NE of Copperopolis	Herman Cordes, Copperopolis (1936)	A 1-ft. vein in slate strikes NW and dips NE.	Some work done 1934-36 by G. B. Haynes. Developed by 150-ft. adit and 30-ft. winze. (Logan 36:243-244.)
	Black Cat				See Bright Star.
	Black George				See Lindsey.
B-39	Black Jack	E½ sec. 11, T. 4 N., R. 10 E., M.D.M., 2 mi. NW of Valley Springs	Not determined	Vein in greenstone strikes N, dips E.	Long idle. Developed by open cuts and shallow shafts.
B-40	Black Oak (Pine Nut, Virginia)	S½ sec. 19, T. 3 N., R. 13 E., M.D.M., 2 mi. NW of Altaville and just W of Highway 49	M. L. Brunson and A. Becker, Sonora	On Mother Lode. Quartz vein with stringers in green schist and phyllite strikes N. 45° W. and dips NE.	Consists of Pine Nut and Virginia claims. Active 1882 and 1904; may have been prospected in 1930s. Developed by 220-ft. shaft, crosscut adit, and open cuts. (MSP 3/25/82:188; 5/-21/04:351.)
B-41	Black Oak	Sec. 33, T. 7 N., R. 13 E., M.D.M.			
B-42	Black Oak and Glory Forth	E½ sec. 13, T. 6 N., R. 13 E., M.D.M., by Licking Fork Mokelumne River, 4 mi. SE of West Point	Peter Portias, West Point	A N-striking vein in quartz diorite gneiss with dikes contains abundant sulfides.	Intermittently active for many years. Developed by two E-crosscut adits connected by 100-ft. raise. Ore treated in 3-stamp mill with Wilfley table and sluice.
B-43	Blackstone	W½ sec. 8, T. 6 N., R. 13 E., M.D.M.	Blackstone Mines, Inc., 5208 Barrett Ave., Richmond 9		(Minerals Yearbook 48-50; herein.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-44	Black Wonder	NE¼ sec. 22, T. 6 N., R. 14 E., M.D.M., N of Licking Fork Mokelumne River, 10 mi. SE of West Point	Leased by Clemens Roark, Las Vegas, Nevada	A 2-ft. vein in slate and mica schist strikes N and dips W; sulfides abundant.	Unpatented claim. Active prior to 1880; intermittently worked 1889-1914; 1918-35, and 1941-42; dump material tested in 1954 by C. M. Roark. Developed by 210-ft. shaft and connecting 900-ft. adit, the portal of which is to the south. Ore treated in 5-stamp mill. (MSP 4/20/89:278; Crawford 96:98; Kerr 00; Tucker 16:70; Hamilton 21:421; Logan 23a: 18; 25:145; 36:244.)
B-45	Black Wonder Extension	S½ sec. 22, T. 6 N., R. 14 E., M.D.M., by Licking Fork Mokelumne River, 10 mi. SE of West Point	Not determined	A 3-ft. vein of white to gray quartz in mica schist strikes N; associated with diorite dike.	Active prior to and during 1930s. Developed by 260-ft. N drift adit. Ore treated in 5-stamp mill.
	Blair				See Triple Lode.
B-46	Blazing Star	SE¼ sec. 2, T. 6 N., R. 13 E., M.D.M., 1 mi. SE of West Point	H. O. Nygaard, P.O. Box 43, 636 Hyde Park Station, Los Angeles	A 2-ft. vein in granodiorite cut by diorite dikes strikes N. 30° W. and dips SW. Ore mined in 1894 averaged $21 to $28 per ton; ore shoot 450 ft. long; sulfides abundant.	Discovered 1862, active until around 1896, and 1914-17. Developed by 400-ft. inclined shaft and 1000 ft. adit. Ore treated in 5-stamp mill. (MSP 7/31/69:70; 2/8/73:84; 7/-19/84:40; Irelan 88:141; MSP 8/15/91:98; Crawford 94:90; 96:98; Kerr 00; Tucker 16:71; MSP 7/21/17:103; Logan 23a:18.)
	Blizzard	Sec. 16, T. 6 N., R. 13 E., M.D.M., 3 mi. SW of West Point	Jack Bardsley, West Point (1936)	Two 2-ft. veins strike NW and dip W; a third 2-ft. vein strikes W and dips N; amphibolite country rock; sulfides abundant.	Active 1933-35. Developed by 157- and 180-ft. inclined shafts. (Logan 36:244.)
	Blood				See Collier.
	Blue Bell	Sec. 17, T. 6 N., R. 13 E., M.D.M., 2 mi. N of Glencoe	Not determined	Quartz vein 3 ft. wide strikes N. 20° E. and dips 30° SE; granodiorite hanging wall, slate footwall.	Active 1896-99, 1911, and 1928. Developed by 600- and 100-ft. adits and 500-ft. of drifts and crosscuts. (Crawford 96:99; MSP 1/14/99:37; 3/11/11:380; Tucker 16:71.)
B-47	Blue Jay	NW¼ sec. 19, T. 6 N., R. 13 W., M.D.M., 1 mi. NW of Glencoe	Not determined	A 3-ft. vein in slate and quartzite strikes N. Ore yielding $32 per ton mined in 1877.	Active around 1877. Developed by 100-ft. shaft now caved. (MSP 4/21/77:245; Kerr 00.)
B-48	Blue Jay	SW¼ sec. 16, NW¼ sec. 21, T. 5 N., R. 12 E.; on ridge S of Calaveras River 3 mi. SE of Mokelumne Hill	C. M. and B. A. Ellingson, R.F.D., Mokelumne Hill	Quartz vein in mica schist and slate strikes N. 20° W. and dips 45° NE.	Active prior to 1900, 1902-05, and 1925-27. Developed by two 125-ft. shafts and a 1,400-ft. adit. Ore treated in 10-stamp mill. Ore from shafts delivered to mill by aerial tramway. (Storms 00:123; MSP 3/29/-02:180; 1/21/05:44; Tucker 16:71; Logan 25:145.)
	Blue Mountain				See Heckendorn.
B-49	Blue Ribbon	E½ sec. 3, T. 4 N., R. 13 E., M.D.M., 1 mi. E of Mountain Ranch	Guido Kustell, Mountain Ranch (1936)	Vein in mica schist and slate strikes N.	Long idle.
	Blue Ribon				See Chaparral and Blue Ribbon.
	Blue Rock				See Afterthought.
	Bode				See Fellowcraft.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-50	Bolitha (Bolitho, Hardy)	E½ sec. 3, T. 2 N., R. 13 E., M.D.M., 1 mi. SE of Angels Camp	James K. Lynch, c/o Chas. J. Lynch, First National Bank Bldg., Canton, Ohio	Mother Lode vein known as Dead Horse lead consists of gold- and pyrite-bearing amphibolite schist with quartz stringers; strikes NW and dips 60° NE; 30 to 40 ft. wide.	Active prior to and from 1894 to around 1900. Developed by 300- and 200-ft. shafts, two adits, and several thousand feet of drifts and crosscuts. (MSP 9/-23/93:205; Crawford 94:93; 96:99; Kerr 00; Storms 00:120-21; Tucker 16:71.)
	Bolitho				See Bolitha.
	Bonanza	Sec. 18, T. 4 N., R. 13 E., M.D.M., 5 mi. E of San Andreas	Not determined	Two veins up to 10-ft. thick in slate strike NW and dip NE.	Active in 1898. Developed by 56-ft. shaft and 200-ft. adit. (MSP 11/19/98:509; Kerr 00.)
	Bonanza	Secs. 20, 29, T. 3 N., R. 12 E., M.D.M., 1 mi. NW of Angels Camp	Not determined	An 8-ft. vein in slate strikes NW and dips NE. On Mother Lode.	Active 1898. Developed by 175-ft. shaft. (MSP 7/23/98:85; Kerr 00.)
B-51	Bonanza	SW¼ sec. 14, T. 2 N., R. 12 E., M.D.M., 4 mi. NNE of Copperopolis	Edward R. and Adolph Reusser, Copperopolis	A 1- to 3-ft. vein containing free gold and sulfides strikes NE and dips SE; talcose footwall and slate hanging wall.	Active in 1920s; prospected 1934. Developed by 95-ft. shaft with levels at 30, 50, and 85 ft. Ore treated in 3-stamp mill. (Logan 36:244-245.)
B-52	Bonanza Pocket	NW¼ sec. 11, T. 3 N., R. 13 E., M.D.M., 3 mi. W of Murphys	George Hauselt, 317 Ocean St., Santa Cruz (1936)	Vein in mica schist strikes W, dips N.	Long idle. Developed by open cuts and shallow shaft now caved.
B-53	Bonehard	NE¼ sec. 33, T. 4 N., R. 13 E., M.D.M., by San Antonio Creek, 1 mi. S of Fricot School	Not determined	Vein in graphitic schist and slate strikes WNW and dips N.	Long idle. Developed by open 100-ft. crosscut adit.
B-54	Bon Ton	SE¼ sec. 24, T. 4 N., R. 13 E., M.D.M., on S side San Antonio Creek, 2 mi. SW of Sheep Ranch	E. W. Farnsworth et al., 1326 East Harvard, Glendale 5	Two parallel 2-ft. quartz veins in mica schist with abundant sulfides strike W.	Active 1882 and intermittently 1933-38 with small output. Developed by open 150-ft. SE adit with drifts and 125-ft. shaft. (MSP 12/9/82:372; Kerr 00; Tucker 16:71; Logan 36:245.)
B-55	Boston (Esperanza)	SW¼ sec. 5, T. 5 N., R. 13 E., M.D.M.	Boston Mokelumne Mining Co., c/o Edward R. Solinsky, Hobart Bldg., San Francisco		(MSP 2/20/75:117; 4/3/80:213; Crawford 94:90; MSP 9/14/95:168; Crawford 96:99, 103; Kerr 00; Storms 00:123; Tucker 16:71-72; Logan 25:145-146; 36:245; Minerals Yearbook 34, 35; Eric 48:218; herein.)
B-56	Boston Flat	Sec. 4, T. 6 N., R. 14 E., M.D.M., 4½ mi. due E of West Point	Not determined	Vein in granodiorite strikes N. 20° E. and dips 45° NW; minor amounts of sulfide present.	Active 1933-38. Developed by open 50-ft. vertical shaft, stopes, and open cuts. (U. S. Bur. Mines records.)
	Bovee				See Sultana. (Storms 00:119; Kerr 00.)
	Bowden	Sec. 26, T. 5 N., R. 12 E., M.D.M., 5 mi. NE of San Andreas	Not determined	A 5-ft. quartz vein strikes N.	Active around 1914. Developed by 150-ft. drift adit. (Tucker 16:72.)
B-57	Boulder	Sec. 32, T. 7 N., R. 13 E., M.D.M.			
B-58	Brazza (Bruzza)	S½ sec. 34, T. 4 N., R. 13 E., M.D.M., by Ponderosa Way, ½ mi. S of Esmeralda	Not determined	A 1-ft. vein in slate and graphitic schist strikes NW and dips NE; some rich pockets found.	Active around 1896. Developed by 70-ft. shaft, 70-ft. drift, and open cut. (Crawford 96:99; Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-59	Bright Star (Black Cat)	NW¼ sec. 35, T. 6 N., R. 12 E., M.D.M., at Rich Gulch, 5 mi. NE of Mokelumne Hill	Aladin Gold Mining Co., Ltd., Holbrook Bldg., San Francisco (1936)	The Bright Star vein, 4 to 12 ft. wide, strikes NE and dips SE; granodiorite and slate country rock; 3 other N-striking and W-dipping veins; ore contains free gold with sulfides.	Active prior to and from 1924 to 1934. Developed by upper 175-, middle 175-, and lower 425-ft. crosscut adits and drifts. Ore treated in 10-stamp mill. (Logan 36:245-246.)
	Bright Star				See Carson Hill.
	Brown (Defiance)	Sec. 18, T. 2 N., R. 12 E., M.D.M., 1 mi. N of Hodson	Jackson D. McCarty Co., c/o Al McCarty, 1246 North Commerce St., Stockton	Vein in amphibolite schist and slate. Ore yielded $8 per ton.	Active 1935. Mined by open cut. Ore treated in 2-stamp mill. (Logan 36:246.)
	Brown				See Carson Hill.
	Brown				See Utica.
	Brown, Smyth & Ryland				See Angels Deep. (Kerr 00.)
B-60	Bruner (Bald Hill, Gold Reserve Cons., St. Lawrence)	NE¼ sec. 10, T. 2 N., R. 13 E., M.D.M., by Highway 49, 1 mi. SE of Angels Camp	R. A. Miller et al., 1265 26th Ave., San Francisco		Active prior to 1888, latter 1890s, 1913-14, 1938, and 1940. Developed by 400-ft. inclined shaft. Ore treated in 10-stamp mill. (Brown 90:150; Preston 93:174; Crawford 94:90; 96:106; MSP 4/22/99; 435; Kerr 00; Storms 00:120; Tucker 16:72; Logan 35:128; herein.)
	Bruzza				See Brazza.
B-61	Buckeye	SE¼ sec. 20, T. 3 N., R. 11 E., M.D.M., 6 mi. E of Jenny Lind	Elizabeth Stalker et al., 15600 Cannon Drive, Los Gatos	A 7-ft. vein in slate and greenstone strikes NW; sulfides abundant.	Long idle. Developed by 80-ft. shaft. (Kerr 00.)
B-62	Buckhorn Cons. (Miralda, Red Gold)	NE¼ sec. 1, T. 3 N., R. 13 E., M.D.M.	Mario D. and Florabelle Ceresa, Murphys		(Crawford 94:90; Kerr 00; MSP 8/26/05:145; Tucker 16:102; herein.)
B-63	Buena Vista	NE¼ sec. 20, T. 2 N., R. 11 E., M.D.M., 4 mi. SE of Milton	Antone Bertatta, Douglas Flat	A 5-ft. vein in greenstone strikes NW and dips 30° SW.	Active around 1888; worked in 1938 by J. H. Merow. Developed by adit and raise. Ore treated in Kendall mill. (Irelan 88:146-147; Kerr 00; U.S. Bur. Mines records.)
B-64	Buena Vista	NW¼ sec. 8, T. 6 N., R. 13 E., M.D.M., 2 mi. SW of West Point and E of Blackstone mine	Not determined	A 2-ft. vein in granodiorite strikes N; abundant sulfides.	Active 1870s and again around 1914. Developed by 150-ft. crosscut adit and 500 ft. of drifts. Ore streated in 5-stamp mill. (MSP 6/16/77:383; Kerr 00; Tucker 16:72.)
B-65	Bull Dog	Sec. 31, T. 6 N., R. 13 E., M.D.M.			
	Bull Frog				See Hardscrabble.
B-66	Bullion				See Mother Lode Central. (Kerr 00; Tucker 16:72.)
	Bullion Hill				See Washington.
	Bumstead				See Twin Oaks.
B-67	Burgess	SW¼ sec. 3, T. 3 N., R. 12 E., M.D.M., 4 mi. S of San Andreas	John Guttinger, San Andreas	A 5-ft. vein in slate and phyllite strikes N. 55° W. and dips 65° NE on Mother Lode.	Active prior to and during 1880s when ore was treated in 20-stamp mill; output worth $18,000 up to 1889. Developed by shaft. (MSP 4/20/89:276; Kerr 00; Logan 36:292.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-68	Butcher Shop	W½ sec. 29, T. 2 N., R. 12 E., M.D.M.	Joseph Palter, Farmington		Herein.
B-69	Calaveras		Fred Stevenot, 300 Montgomery St., San Francisco		See Carson Hill. (Preston 93:169-70; Crawford 94:91; 96:99; Kerr 00; Tucker 16:73; Hamilton 20:15; Logan 21:421; 25:150-51; 35:135-37; Burgess 37:7, 10, 13.)
	Calaveras				See Garner.
	Calaveras				See Mar John.
B-70	Calaveras Columbus (Amador Columbus, Columbus)	S½ sec. 32, T. 7 N., R. 13 E., M.D.M., by Mokelumne River, 2½ mi. NW of West Point	Jeffrey Schweitzer, National Hotel, Jackson	A 2- to 5-ft. vein in granodiorite strikes N and dips 70° W; contains abundant sulfides.	Active 1892-1910, 1921-27, and 1932-35. Developed by 500-ft. crosscut adit, 1,000 ft. of drifts and 90-ft. winze. Ore treated in Gibson mill. (Tucker 16:74; Hamilton 22:26; Logan 23a:19; 23c:18; 24:76; 36:246-47; Eric 48:218.)
	Cal-Gold Mining Company				Leased and prospected Benson, Hoffman, and Parnell properties 1 mile W of Altaville in mid-1930s. See Benson. (Logan 36:247.)
	California (Hicks)	Sec. 22, T. 4 N., R. 13 E., M.D.M., on ridge N of O'Neil's Creek 4 mi. SW of Sheep Ranch	Not determined	Vein in quartz-mica schist strikes NW.	Active 1869 and around 1896. Developed by 80-ft. shaft and 96-ft. adit. (MSP 1/9/69:22; Crawford 96:99-100; Tucker 16:73.)
B-71	Calendar	Sec. 35, T. 7 N., R. 13 E., M.D.M.			
B-72	California Ophir	E½ sec. 14, T. 2 N., R. 13 E., M.D.M., just W of Carson Hill	Marvin Airola, Angels; and Fred G. Stevenot et al., 300 Montgomery St., San Francisco	A 5-ft. vein with greenstone footwall and slate hanging wall.	Idle since 1903. Developed by 600-ft. inclined shaft with levels at 200, 400, and 600 ft. (Kerr 00; Tucker 16:73.)
	Camile				See Corn Meal.
	Canepa	SW¼ sec. 14, T. 2 N., R. 13 E., M.D.M., 1 mi. W of town of Carson Hill	Marvin Airola, Angels Camp	Narrow quartz vein; some rich pockets found.	Active early 1890s. Developed by 75-ft. shaft. (Crawford 94:91; 96:100; Kerr 00.)
	Cargo Hill				See Ferguson.
	Carley				See Falcon.
B-73	Carlton	N½ sec. 9, T. 6 N., R. 13 E., M.D.M., 1½ mi. SW of West Point	W. L. Phillips, and Mason Estate Co., West Point	A 1- to 2½-ft. vein strikes N and is associated with dikes; in 1922 ore yielded $110 per ton; granodiorite country rock; abundant sulfides.	Developed by 250- and 352-ft. adits connected by 86-ft. raise and 40- and 160-ft. shafts. (MSP 9/8/66:150; 8/18/77:101; Crawford 96:100; Kerr 00; Tucker 16:73; Hamilton 22:26; Logan 23a:18; Minerals Yearbook 27, 35.)
B-74	Carson Creek	SW¼ sec. 23, T. 2 N., R. 13 E., M.D.M., by Carson Creek	M. H. Manuel, Murphys		(MSP 2/20/64:114; 7/8/82:20; 7/9/92:28; Preston 93:173-4; Crawford 94:91; 96:100; MSP 7/30/98:109; Kerr 00; Storms 00:123; MSP 2/13/04:118; Tucker 16:88; Logan 36:267; herein.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Carson Hill (Adelaide, Bright Star, Brown, Calaveras, California Ophir, Enterprise, Extension, Finnegan, Independence, Iron Rock, Kentucky, Keystone, Last Chance, Melones, Mexican, Mineral Mountain, Morgan, New Year, Relief, Reserve, Santa Cruz, South Carolina, Stanislaus, Stephens, Union)	Secs. 13, 14, T. 2 N., R. 13 E., M.D.M.	Fred G. Stevenot, 300 Montgomery St., San Francisco		(MSP 2/20/64:114; 4/8/65: 211; 6/22/67:390; Browne 68:59; MSP 9/25/75:200; 2/5/76:88; Hanks 82:148; 84:104; MSP 2/2/89:74; Irelan 90:37-38; Fairbanks 90:56-58; MSP 7/9/92:28; Preston 93:169-170; Crawford 94:89, 91, 94-95; 96:96, 99, 109, 112-13, 116; MSP 11/28/96: 446; 11/5/98:445; 3/31/00: 349; Kerr 00; Ransome 00:9; Storms 00:121; MSP 10/18/-02:225; Bradley 03:53; Tucker 16:66, 73, 87, 92, 93, 97; MSP 2/1/19:165; Hamilton 20:15-17; Young 21:725-729; MSP 2/18/22:235; Hamilton 22:27; Logan 23c:16-17; 24:5; 25:146-151; Moss 27:1010-1012; Knopf 29:72-77; Burgess 35:111-114; Logan 35: 129-137, 207, 208; 36:247-248, 300; Burgess 37:1-15; Julihn 38:100-110; Bowen 48: 55; Burgess 48:89:90; Eric 48: 218; 55:28; herein.)
	Carson Hill Gold Mining Co.	.....	.....	.....	See Carson Hill.
	Carter mill	SW¼ sec. 31, T. 4 N., R. 14 E., M.D.M., at Mercer Cave, 1 mi. NW of Murphys	Sterling Carter, Murphys	.....	Owner has been treating small lots of gold ore from prospects in Murphys-Vallecito area in recently erected mill consisting of jaw crusher, revolving 16-mesh screen, impact mill, table, and amalgam barrel.
B-75	Caruthers	E½ sec. 20, T. 4 N., R. 14 E., M.D.M., by Indian Creek, 3½ mi. N of Murphys	Raymonde Rooney, 1988 Jackson St., San Francisco	Vein in mica schist strikes W and dips N. Sulfides abundant.	Active in late 1880s and early 1890s. Developed by two west-trending drift adits. Ore treated in arrastre. (Tucker 16:73; Logan 36:258.)
B-76	Centennial (New Champion)	NW¼ sec. 4, T. 6 N., R. 13 E., M.D.M.	New Champion Mining Co., c/o H. G. O'Hanlon, West Point	.....	(Minerals Yearbook 47-49; Bowen 49:39-40; herein).
B-77	Champion (Haskins)	SE¼ sec. 4, T. 6 N., R. 13 E., M.D.M.	Josephine Ruffino and Rose Canevaro, 579 Greenwich St., San Francisco	.....	(MSP 2/20/75; 114: 1/22/76: 53; 9/28/78:196; 5/6/82: 308; 5/7/98:493; Crawford 94:91; 96:100; Kerr 00; Tucker 16:73; Logan 23a:18; herein.)
B-78	Chaparral and Blue Ribbon	SE¼ sec. 28, T. 4 N., R. 13 E., M.D.M., ½ mi. S of Fricot Ranch	Raymond Cuneo, San Andreas	A 4-ft. quartz vein with free gold and abundant pyrite strikes W and dips N; mica schist and slate country rock.	Intermittently active 1919-42; surface now being prospected. Developed by 300-ft. N crosscut adit, glory hole, shallow shaft, and two 100-ft. adits. Ore treated in concrete arrastre. (Logan 36:248-249.)
B-79	Chaparral Hill Group (Vanderbilt)	N½ sec. 14, T. 2 N., R. 13 E., M.D.M., ½ mi. NW of town of Carson Hill	Fred G. Stevenot, Miss Effie M. Meeker, Mabel F. Edwards, 300 Montgomery St., San Francisco	Massive Mother Lode quartz vein as much as 100 ft. in width. Ore contained tellurides and arsenopyrite; amphibolite schist country rock.	Active 1881, 1914; prospected 1922-25 by Chaparral Hill Operating Co. Developed by shallow shafts and adits, one 500 ft. long. (MSP 7/16/81: 36; Crawford 96:100; Kerr 00; Tucker 16:73-74; Logan 25: 150; 35:137.)
	Chapman (McGary)	Secs. 10, 11, T. 5 N., R. 13 E., M.D.M., 2½ mi. N of Railroad Flat	Not determined	Vein in schist and slate strikes N.	Active 1881, around 1900, and 1924-25. Developed by 210-ft. shaft with drifts. Ore treated in ball mill. (MSP 5/7/81:292; Logan 25:150.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Charlie Hoss	Sec. 19, T. 6 N., R. 13 E., M.D.M., near Glencoe	A. J. Bayless, Glencoe (1936)	Vein in schist and slate yielded some high-grade pockets.	Prospected by A. J. Bayless in 1930s. Developed by 22-ft. shaft and 180-ft. drift. (Logan 36:249.)
B-80	Chavanne	NW¼ sec. 17, T. 4 N., R. 13 E., M.D.M., at Sheep Ranch	G. D. Martin, Sheep Ranch	.....	Active in 1870s and 1880s when mine was worked through 600-ft. shaft. Ore treated in 10-stamp mill. Consolidated with Sheep Ranch mine in 1883. See Sheep Ranch. (MSP 11/10/77:293; 8/11/83; 86; Kerr 00.)
B-81	Cherokee	Sec. 29, T. 3 N., R. 13 E., M.D.M.			
B-82	Chino (Novella)	NE¼ sec. 11, T. 6 N., R. 13 E., M.D.M., 1½ mi. S of Bummerville	C. C. Meyer, Jr., 1840 Fourth Ave., Sacramento 18	A 1½- to 3-ft. vein with abundant sulfides in granodiorite. Ore yielded as as much as $80 per ton.	Active 1866-69, 1875, 1887, and 1891; $30,000 produced in 1869. Developed by 112-ft. shaft. (MSP 8/25/66:118; 9/25/75:196; 4/25/91:260; Kerr 00; Tucker 16:99.)
	Christman	Sec. 1, T. 3 N., R. 13 E., M.D.M., 1 mi. W of Murphys	Not determined	Vein in slate and mica schist strikes W and dips N.	Long idle. Developed by 80-ft. shaft. (Kerr 00.)
B-83	Christmas	Sec. 1, T. 3 N., R. 13 E., M.D.M.			
B-84	Clary	Sec. 26, T. 6 N., R. 13 E., M.D.M.			
B-85	Claude (Cloud)	Center sec. 10, T. 2 N., R. 13 E., M.D.M., 1 mi. due S of Angels Camp	Kate M. Dorrah et al., c/o Mrs. Philip Huber, 200 W. Broadmoor Blvd., San Leandro	On Mother Lode. An 8- to 12-ft. vein in amphibolite strikes N. 45° W. and dips NE; contains free gold, pyrite, and arsenopyrite; ore mined in 1892 yielded $30 per ton and sulfides $300 per ton. A parallel vein to the east.	Discovered 1885, worked until around 1896. Developed by 45- and 60-ft. shafts, crosscut adit, and open cut. (MSP 11/16/89:376; Brown 90:148; Preston 93:174; Crawford 96: 100-101; Kerr 00.)
	Cleveland	Sec. 8, T. 4 N., R. 13 E., M.D.M., 2 mi. SW of Mountain Ranch	Not determined	Vein in mica schist	Active prior to and during 1889-93. Developed by 100-ft. shaft. Ore treated in 5-stamp mill. (MSP 4/20/89:278; Kerr 00.)
	Cleveland	.....	.....	.....	See Empire.
B-86	Clifton Ranch	Sec. 29, T. 3 N., R. 13 E., M.D.M.			
	Clincher	Sec. 21, T. 4 N., R. 13 E., M.D.M., 1 mi. N of Mountain Ranch	Not determined	Two veins in slate and mica schist strike NW and dip NE; galena abundant.	Long idle. Developed by 60-ft. shaft. (Kerr 00.)
	Cloud	.....	.....	.....	See Claude.
B-87	Collier (Blood, Sandwich)	SW¼ sec. 1, T. 3 N., R. 14 E., M.D.M.	Sterling Carter, Murphys	.....	(MSP 9/28/78:196; 5/10/79: 301; 8/8/85:104; 4/15/99: 405; Tucker 16:74; Logan 36: 249; herein.)
	Colorado	T. 4 N., R. 14 E., M.D.M., 3 mi. N of Murphys	Frank Pescia, Sheep Ranch (1936)	A ½- to 1½-ft. vein in slate strikes W and dips N.	Active many years ago; prospected 1933. Developed by 100-ft. inclined shaft. (Logan 36:249.)
B-88	Columbia (Columbo)	SW¼ sec. 11, T. 2 N., R. 13 E., M.D.M., 2½ mi. S of Angels Camp	Mrs. Rose Ferraris, c/o Jinger Costa, Angels Camp	On Mother Lode. Vein in quartz-ankerite zone with gabbro to east strikes NW and dips NE.	Worked 1914-16 by Columbia Mines Company. Developed by 250-ft. shaft with levels at 100 and 200 ft. Ore treated in 5-stamp mill. (MSP 7/31/15: 184; Tucker 16:74; Logan 35: 137.)
	Columbo	.....	.....	.....	See Columbia.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-89	Columbus (St. Gothard)	Sec. 20, T. 5 N., R. 13 E., M.D.M., in Spring Gulch, 4 mi. NW of Mountain Ranch	James Madona, Mountain Ranch (1936)	A 4-ft. quartz vein in slate strikes W and dips N.	Active prior to 1900 and early during 1930s. Developed by 2 shallow shafts. (Kerr 00; Logan 36:249.)
	Columbus				See Fricot group.
	Columbus				See Calaveras Columbus.
	Comet	Sec. 20, T. 3 N., R. 11 E., M.D.M., 5 mi. E of Jenny Lind	Not determined	A 6-ft. vein in slate strikes NW and dips NE.	Long idle. Developed by 60-ft. shaft. (Kerr 00.)
	Comet				See Kate Hageman.
B-90	Commodore (Golden Gate)	Center sec. 7, T. 4 N., R. 12 E., M.D.M.	Commodore Gold Mining Co., c/o Jones & Quinn, Wilhoit Bldg., Stockton		(Kerr 00; Storms 00:106-07; Tucker 16:82; Logan 35:137-38; 36:243; herein.)
	Confidence				See Utica. (MSP 6/30/83:436; Kerr 00.)
B-91	Continental	SW¼ sec. 33, T. 7 N., R. 13 E., M.D.M., by Mokelumne River 1 mi. N of West Point	Hazel S. Wardell, 1885 Atlas Road, Napa	Vein in granodiorite strikes N; abundant sulfides.	Active in 1902-03; operated from 1936-42 by H. S. Wardell; 413 tons of ore yielded 213 oz. of gold in 1939. Developed by drift adit. Ore treated in 5-stamp mill with 2 flotation cells. (MSP 5/10/02: 261; Logan 36:266; Minerals Yearbook 1940.)
B-92	Cook	Sec. 23, T. 3 N., R. 13 E., M.D.M., 1½ mi. NE of Angels Camp	Domingo Roleri, Angels Camp (1936)	A 1- to 4-ft. vein associated with a dike; much sulfide.	Some activity during the 1890s. Developed by a shaft. (Crawford 94:91-92; 96:101; Kerr 00.)
	Cooper	T. 4 N., R. 13 E., M.D.M., 5 mi. N of Murphys, on ridge between San Antonio and Indian Creeks.	Frank Cooper, Douglas Flat (1936)	Three 2- to 8-ft. veins in mica schist strike NE.	Active prior to and during 1936. Developed by 100- and 160-ft. shafts and 300-ft. adit. (Logan 36:249.)
	Coralie	Sec. 27, T. 4 N., R. 13 E., M.D.M., near Fricot School	Not determined	A 30-ft. vein zone in slate strikes W and N.	Long idle. Developed by 100-ft. adit. (Kerr 00.)
	Cordova				See Union-Rathgeb group.
B-93	Corn Meal (Camile)	NE¼ sec. 13, T. 6 N., R. 13 E., M.D.M., 3 mi. SE of West Point	Daniel Filippine, Mountain Ranch (1936)	Vein in granodiorite strikes E, dips 80° N; abundant sulfides.	Active prior to 1914, and during 1917; worked by Rhad Adams in 1941. Developed by 300-ft. upper and 400-ft. lower adit. (Tucker 16:75; MSP 7/21/17: 103.)
B-94	Cow Bell	SW¼ sec. 22, T. 4 N., R. 13 E., M.D.M., by Ponderosa Way, 1 mi. N of Fricot School	Charles H. Kucks, 4386 Montgomery St., Oakland	A 4-ft. vein with sulfides in mica schist strikes W and dips 45° N.	Long idle. Developed by 300-ft. upper and 275-ft. lower W drift adits.
B-95	Cow Bell	NE¼ sec. 15, T. 5 N., R. 13 E., M.D.M., on ridge S of Esperanza Creek, 4 mi. S of Railroad Flat	G. W. Getchell estate, San Andreas (1936)	A white to gray quartz vein with pyrite and galena in mica schist strikes N. 30° W. and dips 65° NE.	Active many years ago; operated by L. A. Sackett in 1941. Developed by caved 40-ft. shafts and 500 ft. of drifts. (U. S. Bur. Mines records.)
	Crooks and Smith	Sec. 11, T. 2 N., R. 13 E., M.D.M., near Carson Flat	Not determined	Wide vein zone with greenstone hanging wall and slate footwall strikes NW and dips NE; on Mother Lode.	Long idle. Worked through 45-ft. shaft. (Kerr 00.)
B-96	Cross	Secs. 24, 25, T. 7 N., R. 13 E., M.D.M.			

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-97	Crossette	E½ sec. 26, T. 3 N., R. 12 E., M.D.M., by Cherokee Creek, 4 mi. due W of Altaville	Not determined	Quartz vein in slate strikes NW and dips NE.	Active around 1914, 1929, and 1940. Developed by 80-ft. shaft. (Tucker 16:75.)
B-98	Crown Point	W½ sec. 1, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Murphys	M. H. Manuel, Murphys	Several quartz veins in slate and mica schist strike W and dip N; some high-grade pockets.	Active 1905-09, 1914, 1925, and prospected 1936. Developed by open 225-ft. adit, 65-ft. shaft, and drifts. (MSP 11/27/09:731; Tucker 16:75; Logan 36:250.)
	Crown Point and Teirakoff	T. 6 N., R. 13 E., M.D.M., 2½ mi. NW of West Point	Not determined	Vein in granodiorite strikes N.	On N side South Fork of Mokelumne River. Active around 1894. (Crawford 94:92.)
B-99	Crystal	W½ sec. 33, T. 3 N., R. 13 E., M.D.M., in Angels Camp	Utica Mines, Inc., 220 Montgomery St., San Francisco		Consolidated by Angels Quartz Mining Co. 1886 with Angels mine, which see herein. (Brown 90:61; Crawford 96:101; Kerr 00; MSP 7/11/03:27; 4/91 10:537.)
B-100	Culbertson	NW¼ sec. 8, T. 4 N., R. 12 E., M.D.M., 1½ mi. N of San Andreas	Not determined	Two veins in zone 34 ft. wide strike NW and dip NE; greenstone hanging wall and slate footwall.	Active 1896-1900. Developed by 120-ft. shaft and 400-ft. adit. (Crawford 96:101; MSP 5/9/96:382; 6/10/99:617; Kerr 00.)
	Cuneo				See Economic.
	Curtis				See Star of India.
	Cushing				See Sultana. (Crawford 96:101.)
B-101	Curiosity	Sec. 5, T. 2 N., R. 13 E., M.D.M.			
B-102	Curtis	Sec. 29, T. 3 N., R. 13 E., M.D.M.			
	Dal A Ray	Not determined	Not determined		Between Mokelumne Hill and San Andreas. Operated 1941 by Ray Hageman of San Francisco. Vein developed by 130-ft. inclined shaft and 80-ft. drift. (U. S. Bureau of Mines records.)
B-103	Dalmatia (Delmatia, Delmazia)	E½ sec. 26, T. 4 N., R. 13 E., M.D.M., 3 mi. NW of Murphys	Not determined	A zone 22 ft. wide, containing quartz veins and seams in slate, strikes NW and dips NE.	Active around 1896-1900. Developed by 100-ft. adit and 200-ft. shaft. Ore treated in arrastre. (Crawford 96:101-102; Kerr 00; Tucker 16:76.)
B-104	Dan Reynolds				See Poe.
B-105	Dauphine	SW¼ sec. 14, NW¼ sec. 23, T. 5 N., R. 12 E., M.D.M., 1 mi. SE of Jesus Maria	Not determined	Two veins in 7-ft. zone strike NE and dip SE; free milling ore with sulfides; granite hanging wall and slate footwall.	Discovered 1851; active 1889-91. Developed by 100-ft. shaft, 140-ft. adit, and open cut. Ore treated in 1-stamp mill. (MSP 11/23/89:394; 11/13/91:68; Kerr 00.)
	Dead Horse				See Utica. (Fairbanks 90:61; MSP 11/20/97:486; Kerr 00.)
	Dean	8 mi. E of Milton	Not determined	Vein in slate strikes N and dips 20° W.	In Salt Spring Valley. Active around 1896. Ore treated in 2-stamp mill. (Crawford 96:102.)
	Deerfoot (Gilbertson)	Sec. 34, T. 7 N., R. 13 E., M.D.M., 1½ mi. N of West Point	Not determined	A 1-ft. quartz vein in granodiorite strikes N. 30° W., dips 70° NE.	Active around 1914-17. Developed by 150-ft. adit and 66-ft. winze. Ore treated in 5-stamp mill. (Tucker 16:75; MSP 7/21/17:103.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
-106	Deer Lodge..... (Pierce)	N½ sec. 12, T. 3 N., R. 14 E., M.D.M., on ridge above Stanislaus River, 4½ mi. due E of Murphys	Rose M. Machado, Whiskeytown	Vein in mica schist strikes W and has nearly vertical dip.	Active prior to 1914; prospected 1930. Developed by 100-ft. upper and 200-ft. lower drift adits. (Kerr 00; Tucker 16:75.)
	Defiance.....	.....	.....	.....	See Brown.
	Delmatia.....	.....	.....	.....	See Dalmatia.
	Delmazia.....	.....	.....	.....	See Dalmatia.
	Del Monte.....	.....	.....	.....	See Prussian Hill.
3-107	Demarest.....	NE¼ sec. 16, T. 3 N., R. 12 E., M.D.M.	M. H. Manuel, Murphys	.....	(MSP 6/10/93:357; Crawford 94:92; MSP 12/13/99:723; Kerr 00; Storms 00:107; MSP 2/13/04:118; Tucker 16:76; Logan 25:151; 35:138; 36:250; herein.)
3-108	Demarest.....	Sec. 33, T. 3 N., R. 13 E., M.D.M.			
3-109	Diamond Jack...	NE¼ sec. 14, T. 2 N., R. 11 E., M.D.M., 7 mi. E of Milton and S of Salt Springs Reservoir	Howard J. Tower et al., Farmington	A 9-ft. vein in greenstone strikes NW.	Active 1896. Worked through 50-ft. shaft. (MSP 11/21/96:426.)
	Doc Hill.....	.....	.....	.....	See Angels.
	Dodson (McQuig)	Sec. 12, T. 3 N., R. 13 E., M.D.M., 1½ mi. mi. SW of Murphys	Not determined.....	A 1-ft. blue quartz vein in Calaveras slate strikes W and dips N.	Unpatented claim. Active during 1890s. Developed by 100-ft. adit. Ore treated in 5-stamp mill. (Crawford 94:92; 96:112; MSP 3/25/99:323; Tucker 16-76.)
B-110	Dolly Varden...	W½ sec. 18, T. 3 N., R. 14 E., M.D.M., 2 mi. SW of Murphys	Not determined.....	Vein in quartz-mica schist strikes NW and dips NE.	Long idle.
	Dominion Mining Organization, Inc.	.....	.....	.....	Prospected Modoc, Star of the West, and Zacatero mines NE West Point in 1922-25. Adit was driven. (Logan 25:151-52.)
	Donald C.....	Sec. 24, T. 2 N., R. 13 E., M.D.M., by Carson Hill	Not determined.....	Vein with greenstone hanging wall and slate footwall strikes NW and dips NE; sulfides abundant.	Long idle. Worked through 50-ft. adit and open cut. (Kerr 00.)
	Donnallan.....	Sec. 6 or 7, T. 4 N., R. 12 E., M.D.M., 2 mi. NW of San Andreas	Not determined.....	On Mother Lode. A mineralized zone 40 to 200 ft. in width in weathered talcose slate and schist. Ore averaged $2.50 per ton.	Active around 1896. Mined in open cut and treated in 15-stamp mill. (MSP 6/13/96:486; Crawford 96:102; Kerr 00.)
	Donner.....	.....	.....	.....	See Nancy Ann.
	Doodlebug claims	Sec. 22, T. 5 N., R. 12 E., M.D.M., 1 mi. SE of Jesus Maria	W. T. Treat, San Andreas (1936)	Main quartz vein strikes N. 80° E. and dips 70° NW; footwall is slate and hanging wall is granodiorite.	Active mid-1930s. Developed by 4 adits. Ore treated in 2-stamp mill; later in ball mill with tables. (Logan 36:250-51.)
B-111	Dora Cons. (Rustler)	NW¼ sec. 36, T. 4 N., R. 13 E., M.D.M., 3 mi. NW of Murphys	Dora Gold Mining Co., c/o Lester L. Roth, 50 Arguello Blvd., San Francisco 18	A 1- to 4-ft. vein in mica schist and slate strikes W and dips N.	Developed by two open 200-ft. adits and 75-ft. shaft. Ore treated in 5-stamp mill. (Crawford 94:92; 96:102; MSP 1/-20/94:45; Kerr 00; Tucker 16:86-87.)
B-112	Dragone (Arizona)	NE¼ sec. 1, T. 3 N., R. 13 E., M.D.M., on San Domingo Creek 1 mi. W of Murphys	Louise R. Dragone et al., Angels Camp	A 1- to 6-ft. quartz vein in slate with dike strikes N. 75° W. and dips NE; 2 cross veins; much sulfide.	Active 1934. Developed by 436-ft. lower and 120-ft. upper adit connected by 140-ft. raise. (Logan 36:251.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Drake properties	Secs. 3, 4, T. 2 N., R. 13 E., M.D.M., 1 mi. SE of Angels Camp	Not determined.....	On Mother Lode in greenstone and slate.	Active prior to 1900. Two prospect shafts 900 and 300 ft. deep. (Storms 00:121.)
	Dublin.....	.....	.....	.....	See Morning Star.
	Dunlap.....	8 mi. E of Milton.....	Not determined.....	.....	In Salt Spring Valley. Active around 1895. Developed by 70-ft. vertical shaft. Ore treated in 2-stamp mill. (Crawford 96: 102.)
B-113	Dutchess Consolidated	SE¼ sec. 5, NW¼ sec. 9, T. 2 N., R. 14 E., M.D.M.	Duchess Mining & Milling Co., Inc., 653 American Ave., Long Beach	.....	(MSP 10/20/00:469; Tucker 16: 76; Logan 36:251; herein.)
	Dutton.....	Sec. 6, T. 3 N., R. 13 E., M.D.M., ¾ mi. SE of Glencoe	Charles Dutton, Glencoe (1936)	Vein containing rich pockets.	Unpatented claim. Active 1934. Developed by 90-ft. shaft. (Minerals Yearbook 35; Logan 36:251.)
	Early Bird.....	.....	.....	.....	See Standard.
B-114	Easyz Bird..... (Big Pine, Le Roi)	S½ sec. 6, T. 5 N., R. 12 E., M.D.M.	Wah Chang Mining Corp., 137 Clarke St., Bishop	.....	(MSP 2/22/02:106; Tucker 16: 76; Minerals Yearbook 17; Logan 25:152; 36:251-53; Minerals Yearbook 35, 37-41; Julihn 38:119-122; herein.)
B-115	Eberhardt.....	NE¼ sec. 23, T. 6 N., R. 13 E., M.D.M., by South Fork Mokelumne River, 2 mi. N of Railroad Flat	F. E. Herzer, Murphys (1935)	Several veins, one as much as 15 ft. in width, strike N and dip E; slate country rock.	Active many years ago. Developed by 400-ft. drift adit and 70-ft. shaft. (Kerr 00.)
	Eclipse.....	Sec. 29, T. 3 N., R. 13 E., M.D.M., 1½ mi. NW of Angels Camp	Not determined.....	A 6-ft. vein in greenstone strikes N. 65° W. and dips 70° NE. On Mother Lode.	Active prior to and during early 1890s. Developed by 115-ft. shaft and two adits. Ore treated in Huntington mill. (MSP 1/2/-92:4; Preston 93:171; Crawford 94:92, 97; 96:102.)
B-116	Economic (Cuneo)	NW¼ sec. 34, NE¼ sec. 33, T. 4 N., R. 13 E., M.D.M.	Raymond Cuneo, San Andreas	.....	(MSP 12/24/10:852; Tucker 16-77; herein.)
B-117	Edna.....	SE¼ sec. 36, T. 5 N., R. 11 E., M.D.M., 4 mi. NW of San Andreas near Spring Gulch	Edna Gold Mining Co., c/o Mrs. Lena H. W. Bartels, 2243 Santa Clara Ave., Alameda	A mineralized dike 36 ft. in width, containing quartz.	Active early 1890s. Developed by 145-ft. shaft. (Crawford 94: 92; 96:102-03; Kerr 00; Tucker 16:77.)
	Eida.....	Sec. 4, T. 4 N., R. 13 E., M.D.M., 1 mi. S of Mountain Ranch	Not determined.....	Vein in slate and schist.....	On ridge between El Dorado and Murray Creeks. Prospected prior to 1914. Shaft 85 ft. deep. (Tucker 16:77.)
	El Dorado.....	.....	.....	.....	See Murry Creek.
	El Dorado.....	.....	.....	.....	See Triple Lode.
	Elsie.....	Sec. 9, T. 5 N., R. 13 E., M.D.M., 3 mi. SW of Railroad Flat	Not determined.....	Two 1-ft. veins in slate strike NW, dip NE.	Active prior to and during early 1900s. Worked through 40-ft. shaft and adit. (Kerr 00.)
B-118	Emma.....	E½ sec. 15, T. 4 N., R. 10 E., M.D.M., 2 mi. NW of Valley Springs	Leslie Land, Valley Springs	Veins in greenstone; surface gravels.	Long idle; some intermittent surface prospecting by Richard Horner of Valley Springs. Developed by shallow shafts and open cuts.
	Emma.....	.....	.....	.....	See Royal.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-119	Empire (Cleveland, Jumbo, Uno)	N½ sec. 30, T. 2 N., R. 12 E., M.D.M.	Effie M. Tower, Farmington	.....	(MSP 7/21/83:36; Crawford 96:103; Logan 25:152; 36:253-54; herein.)
	Enchantress.....	.....	.....	.....	See Mar John.
	Enterprise.....	.....	.....	.....	See Melones and Carson Hill.
B-120	Esmeralda.....	N½ sec. 34, T. 4 N., R. 13 E., M.D.M., on ridge between Indian and San Antonio Creeks, E of Esmeralda School	John F. Davis Estate, c/o John P. Davis, 38 Sansome St., San Francisco 4	.....	(MSP 4/24/86:280; 2/19/87:128; Irelan 88:133-135; MSP 5/5/94:285; Crawford 96:103; Kerr 00; Tucker 16:77, 108; herein.)
	Esmeralda Ext....	.....	.....	.....	See Bence.
	Esperanza.....	.....	.....	.....	See Boston.
B-121	Etna (Aetna, McKisson)	SE¼ sec. 18, T. 6 N., R. 13 E., M.D.M.	Calvin Snyder, Stockton; leased to O. C. Brink and E. J. Nuhn, P.O. Box 1021, Stockton	.....	(Tucker 16:66; Logan 36:274-75; herein.)
B-122	Etna King (North End, Widow, Ziegler)	Sec. 33, T. 3 N., R. 13 E., M.D.M., in Angels Camp	George and Julia Umberger, 831 N. Hunter St., Stockton	On Mother Lode; a 12-ft. vein in amphibolite schist strikes NW and dips 80° NE.	Active 1880s, 1897 to 1909, and 1914. About 3000 tons of ore mined. Developed by 240-ft. vertical shaft with levels at 100 and 200 ft., and 500 ft. of drifts. Ore treated in 20-stamp mill. (MSP 7/11/85:24; Tucker 16:77-78; Logan 35:151-52.)
B-123	Ettie B.....	SE¼ sec. 26, T. 5 N., R. 13 E., M.D.M., 3 mi. NE of Mountain Ranch	Not determined.....	Vein in quartz-mica schist strikes N.	Long idle.
B-124	Eureka.....	Sec. 1, T. 3 N., R. 13 E., M.D.M.			
	Eureka.....	Sec. 22, T. 6 N., R. 14 E., M.D.M., 3 mi. NW of Blue Mountain	Mary Rowe and Thomas Jenkins, Grass Valley (1936)	Two veins in slate strike NNE and dip W.	Unpatented claim. Active 1889-96. Developed by 120-ft. adit and 500 ft. drift. (MSP 9/14/89:204; 3/21/96:230; Kerr 00.)
B-125	Evening Star.....	Sec. 32, T. 3 N., R. 13 E., M.D.M., 1 mi. W of Angels Camp	A. F. Salfield, 250 E. Mariposa Ave., Stockton (1936)	On Mother Lode. Vein with green schist hanging wall and phyllite footwall strikes N. 55° W. and dips NE; contains abundant pyrite, calcite, and ankerite.	Extensively worked many years ago. Developed by caved shaft and long open cut. Ore was treated in Huntington mill. (Kerr 00.)
B-126	Everlasting..... (Seiffard)	E½ sec. 19, W½ sec. 20, T. 4 N., R. 12 E., M.D.M.	C. J. Tiscornia, San Andreas	.....	(MSP 3/16/72:164; 2/21/74:117; 7/9/87:24; Fairbanks 90:63-64; Crawford 94:92; 96:103; Tucker 16-78; Logan 36:242-243; herein.)
	Excelsior.....	T. 3 N., R. 13 E., M.D.M., in Angels Camp, E of Gold Cliff mine	Not determined.....	A 3- to 14-ft. vein in green schist with much sulfide.	Active 1880-92 and in early 1930s. Developed by 120-ft. crosscut adit and 75-ft. shaft. (MSP 7/24/80:52; 7/9/92:28; Preston 93:175; Crawford 96:103.)
B-127	Ever Ready.....	Sec. 32, T. 7 N., R. 13 E., M.D.M.			
B-128	Excelsior.....	N½ sec. 18, T. 5 N., R. 12 E., M.D.M., 1 mi. SE of Mokelumne Hill just N of Lamphear mine.	Mrs. Almena Moser, Mokelumne Hill (1936)	A 1- to 16-ft. vein in slate strikes NW.	Active around 1896. Developed by 1,200-ft. adit and 185-ft. shaft. See also Lamphear. (Crawford 96:104; Kerr 00; Tucker 16:78.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-129	Extension				See Carson Hill.
	Fairfax				See Waterman.
B-130	Fair Play	N½ sec. 1, T. 3 N., R. 13 E., M.D.M., by San Domingo Creek 2 mi. NW of Murphys	Cyril Monte Verda et al., Altaville	Two quartz veins as much as 7 ft. in width in slate strike NW and dip NE.	Active in 1870s; according to newspaper article, prospected 1934 by M. H. Rauchioso of Murphys. Developed by 500-ft. adit and open cut. Ore treated in 5-stamp mill. (MSP 10/25/79:261; Kerr 00.)
B-131	Falcon (Carley, Louisa)	SE¼ sec. 1, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Murphys	Lelia D. Carley, Box 22, Murphys	Narrow but rich veins in mica schist quartzite strike W, dip N.	Active prior to 1894, and in 1894, 1895, 1897, 1932; operated 1942 by G. L. Carley of Murphys. Developed by 215-ft. shaft and adit. In 1895, ore was treated in 5-stamp mill. (MSP 9/14/95:168; Crawford 94:94; 96:104; Kerr 00.)
B-132	Fazzi (Jolly Tar, Mariposa)	NE¼ sec. 29, NW¼ sec. 28, T. 3 N., R. 13 E., M.D.M., ½ mi. N of Altaville	Elvia Woods Riva et al., 4838 Foothill Blvd., Oakland 1	On Mother Lode. Three parallel quartz veins in amphibolite schist strike NW and dip 75° NE.	Discovered 1921; intermittently active in 1920s and from 1935 to about 1938; diamond drilled in 1941. Developed by 300-ft. shaft with 2 levels. Ore treated in 10-stamp mill with Frue vanners. (Logan 24:5; 178; 35:142; 36:254; Julihn 38:128-129.)
B-133	Fellowcraft (Bode, Veritas)	E½ sec. 17, T. 4 N., R. 12 E., M.D.M.	C. J. Tiscornia, San Andreas		(MSP 5/2/85:288; 7/27/96:523; Brown 90:149-50; Preston 93:178; Crawford 94:92; 96:104; Kerr 00; Storms 00:105; Tucker 16:78; Logan 35:138-39; herein.)
B-134	Fenian (Finian)	NE¼ sec. 20, T. 4 N., R. 14 E., M.D.M., by Indian Creek and W of Mar John mine, 4 mi. N of Murphys	Mary Jane Osselin, Sheep Ranch	Vein in quartz-mica schist strikes W and dips 75° S; sulfides abundant.	Active 1880s and early 1890s. Developed 90-ft. shaft now caved. (Crawford 96:104; Kerr 00; Tucker 16:78-79.)
	Ferguson (Cargo Hill)	Sec. 1, T. 6 N., R. 13 E., M.D.M., 2 mi. E of West Point	Carroll Evans et al., 1144 Yale St., Santa Monica (1936)	An 8-in. bluish-black quartz vein in granodiorite strikes N, dips 80° W; several diorite dikes.	Active prior to 1913, and from 1935-36. Developed by 165-ft. shaft. (Tucker 16:78; Logan 36:254-255.)
B-135	Fidelity	SE¼ sec. 30, T. 6 N., R. 13 E., M.D.M.	E. E. Allen, 145 Persia St., San Francisco		(MSP 4/20/89:276; Kerr 00; Tucker 16:78; Logan 36:266; herein.)
	Finck	Sec. 15, T. 5 N., R. 11 E., M.D.M., N of Gwin mine	Not determined	Several veins on slate-granite contact strike NW and dip NE	Long idle. Worked through 335-ft. shaft and open cut. (Kerr 00.)
B-136	Fine Gold	S½ sec. 29, T. 6 N., R. 14 E., M.D.M.	W. P. Caubu, c/o The Drinkhouse Agency, 1257 Shrader St., San Francisco		(MSP 9/5/85:162; 11/21/85:344; Irelan 87:34-35; Crawford 96:104; Kerr 00; Tucker 16:78; Logan 36:255-56; 289; Minerals Yearbook 37, 38, 48; herein.)
	Finian				See Fenian.
B-137	Finnegan	SW¼ sec. 13, T. 2 N., R. 13 E., M.D.M.	Fred G. Stevenot et al., 300 Montgomery St., San Francisco		See Carson Hill. (MSP 6/15/67:374; 7/11/91:20; Crawford 94:92; 96:104; Kerr 00; MSP 4/2/10:505; 5/18/15:740; Tucker 16:79; Logan 21:421-22; Hamilton 22:26; Logan 24:178; 25:153; 35:139.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	First Chance	Sec. 25, T. 4 N., R. 13 E., M.D.M., near Esmeralda	Not determined	A 3-ft. vein in slate strikes NW and dips NE.	Long idle. Worked through 50-ft. adit. (Kerr 00.)
	First Chance	Sec. 35, T. 6 N., R. 13 E., M.D.M., just S of Railroad Flat	John C. Schoy, Mokelumne Hill (1936)	Vein in schist and slate	Operated 1936-42 by C. H. Johnson, San Andreas. Developed by 200-ft. adit. (U. S. Bur. Mines records.)
	Fler de Ora				See Alpha and Omega.
	Fontanac	Sec. 27, T. 4 N., R. 13 E., M.D.M., near Fricot School	Not determined	Several veins in slate strike W and dip N.	Long idle. Worked through 60-ft. shaft and 230-ft. adit. Ore treated in arrastre. (Kerr 00.)
	Foote & Thompson				See Quartz Glen.
B-138	Ford (Apex)	SE¼ sec. 17, T. 4 N., R. 12 E., M.D.M.	Mrs. Ann Dower, W. W. Steele, Edith Steele, c/o W. W. Steele, Jackson		(MSP 5/9/96:382; 12/9/99: 667; Crawford 96:104; Kerr 00; Ransome 00:9; Storms 00: 107-08; Tucker 16:79-80; Logan 23c:18; 24:4,76; 25:144; Knopf 29:70-71; Logan 35: 139-40; 36:257; herein.)
	Forest Creek	Secs. 7, 18, T. 6 N., R. 14 E., M.D.M., 4 mi. SE of West Point	Not determined	A ½-ft. to 2-ft. vein in granodiorite strikes NE; sulfides abundant.	Unpatented claim. Operated by Forest Creek Mining Company intermittently, 1923-29. Developed by 420-ft. N drift adit and 55-ft. winze, 225 ft. in from portal. (Logan 24:76; 25: 153; 36:257-258.)
B-139	Foster	Sec. 33, T. 3 N., R. 13 E., M.D.M.			
	Four Hundred	Secs. 5, 6, T. 4 N., R. 13 E., M.D.M., on ridge W of El Dorado Creek, 2 mi. W of Mountain Ranch	Not determined	Vein in slate and graphitic schist.	Active about 1914. Developed by 200-ft. shaft and crosscut adit. (Tucker 16:109.)
	Fox				See Angels.
	Franklin	Sec. 30, T. 3 N., R. 11 E., M.D.M., 6 mi. E of Jenny Lind	Elizabeth Stalker et al., 15600 Cannon Dr., Los Gatos	Several veins in slate and greenstone strike NW; sulfides abundant.	Long idle. Developed by 50-ft. shaft. (Kerr 00.)
B-140	Fredda	Secs. 1, 12, T. 6 N., R. 13 E., M.D.M.			
	French				See Arthur.
B-141	French Hill	N½ sec. 7, T. 5 N., R. 12 E., M.D.M., on French Hill ½ mi. E of Mokelumne Hill	French Hill Gold Mines, c/o John I. Bolen, Citizen Savings Bank Bldg., Pasadena	A 6-ft. vein strikes N and dips E.	Active around 1900. Developed by crosscut adit. (MSP 8/11/00:159; Storms 00:125.)
	French & Wood				See Carson Hill.
B-142	Fricot group (Columbus, Rochester)	NW¼ sec. 27, NE¼ sec. 28, T. 4 N., R. 13 E., M.D.M., in Fricot Ranch area 5 mi. NW of Murphys	State of California (Fricot School)	A series of E-striking and N-dipping veins in mica schist.	Group of lode and placer claims. Long idle. Included Columbus, Rochester, and Fricot Consolidated mines. Developed by shafts and adits.
	Fritz	Sec. 28, T. 3 N., R. 13 E., M.D.M.			See Sultana. (Crawford 96:104.)
	Galena-Gold (Gold-Galena)	Sec. 35, T. 7 N., R. 13 E., M.D.M., on ridge SE of Skull Flat, 2 mi. NE of West Point	L. F. Bruener, 6th and K Sts., Sacramento (1936)	Main quartz vein in granodiorite strikes N. 16° W., dips 80° SW. Much galena and pyrite. Ore averaged $40 per ton.	Active 1902-06; operated by Winsor Investment Company 1935-36. Developed by 200-ft. shaft with levels at 100 and 200 ft. and drifts. (MSP 1/25/-02:53; Tucker 16:82; Logan 23a:21; 36:258.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	G. A. R.	.....	.....	.....	See Tracy.
B-143	Garfield	Sec. 1, T. 3 N., R. 13 E., M.D.M.			
	Garibaldi	Sec. 24, T. 3 N., R. 12 E., M.D.M., 3 mi. NW of Altaville	Rosa Cassinelli et al., 350 Euclid Ave., Oakland (1936)	Vein zone as much as 250 ft. in width in slate and greenstone strikes NW; on Mother Lode.	Active many years ago; prospected in 1930s. Worked through shallow shaft and 400-ft. adit. (Kerr 00.)
B-144	Garibaldi	E½ sec. 30, T. 6 N., R. 13 E., M.D.M., ½ mi. due S of Glencoe	C. E. Shufelton, 17 Chatanooga St., San Francisco	Several veins in slate strike NW, dip NE; abundant sulfides.	Active prior to 1914; prospected in 1930s. Developed by 60- and 40-ft. shafts. (Kerr 00; Tucker 16:80; Logan 36:259.)
	Garland Ranch	Secs. 8, 18, T. 3 N., R. 14 E., M.D.M., 2 mi. S of Murphys	W. B. Lenhart, 1424 East Ocean Ave, Long Beach (1936)	Lode and placer deposits. Several NE-striking veins with abundant pyrite. Two Tertiary channels 18 to 35 ft. thick overlain by andesite.	Active prior to and during 1935-36. Veins are developed by open cuts and short adit. Channel developed by 60-ft. shaft and drifts. (Logan 36:259.)
	Garner (Baltimore, Calaveras)	T. 5 N., R. 11 E., M.D.M., by Big Bar in Amador and Calaveras Counties, 2½ mi. N of Mokelumne Hill	Not determined.....	On Mother Lode. Vein in diorite strikes NE and dips NW.	Active prior to 1889 and from 1889 to around 1901. Developed by vertical shaft and crosscut adit. Ore treated in 10-stamp mill. (MSP 4/20/89: 278; 6/3/99:590; Crawford 96:105; Storms 00:123-124.)
B-145	Gaston Hill	SW¼ sec. 10, SE¼ sec. 9, T. 4 N., R. 13 E., M.D.M., 1½ mi. due S of Mountain Ranch in Dirty Gulch	Robert C. Burge, and Charles P. Yeager, Mountain Ranch	A 2½-ft. vein in mica schist and slate strikes N. 80° W. and dips N; contains free gold and sulfides; brown opal present. Ore mined in early operations yielded $15 per ton.	Active prior to and during 1880s and 1930s; intermittently prospected since. Developed by old caved 160-ft. shaft and new open shaft. (MSP 1/22/87:56; 4/20/89:276; Kerr 00.)
	Gateway	Sec. 15, T. 1 N., R. 12 E., M.D.M., 3 mi. S of Copperopolis	Not determined.....	Vein in greenstone and slate strikes NW and dips NE.	Active 1936-40. Developed by 300-ft. shaft. Ore treated in stamp mill. (U. S. Bur. Mines records.)
B-146	General Arthur	Sec. 24, T. 7 N., R. 13 E., M.D.M.			
B-147	German Ridge and Jupiter	Secs. 15, 16, T. 3 N., R. 13 E., M.D.M.	German Ridge and Jupiter Gold Mines Corp., c/o Mrs. M. M. E. Johnson, Angels Camp	.....	(Brown 90:148-49; Crawford 96: 105; Kerr 00; Tucker 16:80; Logan 36:259-60; Julihn 38: 133-134; herein.)
	Geravanti	Secs. 14, 15, T. 5 N., R. 11 E., M.D.M., 3 mi. W of Mokelumne Hill	Not determined.....	Vein in slate.....	Active prior to 1914. (Tucker 16:80.)
B-148	Gertrude	NE¼ sec. 25, T. 4 N., R. 12 E., M.D.M., 2 mi. NE of Calaveritas	J. J. Agostini, Angels Camp (1936)	Vein in slate and mica schist strikes N.	Prospect; long idle.
B-149	Ghost	SW¼ sec. 34, T. 3 N., R. 13 E., M.D.M., in E portion of Angels Camp	Not determined.....	A vein as much as 20 ft. thick in amphibolite strikes NW and dips NE.	Active 1896 to around 1900, and 1921; dump later used as road fill. Developed by N open 1350-ft. and S 350-ft. shafts with crosscuts. (Crawford 96: 105; MSP 11/28/96:446; Tucker 16:80-81; Logan 21: 424.)
	Gilbertson	Sec. 23, T. 7 N., R. 13 E., M.D.M., on ridge above Mokelumne River, 4 mi. NE of West Point	Not determined.....	Vein in granodiorite strikes N; abundant sulfides.	Active prior to 1913. Developed by 70-ft. drift adit and 70-ft. shaft. (Tucker 16:80.)
	Gilbertson	.....	.....	.....	See Deerfoot.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-150	Gilded Age	Sec. 17, T. 6 N., R. 13 E., M.D.M., by South Fork Mokelumne River, 3 mi. SW of West Point	Not determined	Vein in granodiorite strikes N, dips W; abundant sulfides.	Long idle. Developed by N-trending 200-ft. adit. (Kerr 00.)
	Gladiator	Sec. 1, T. 5 N., R. 11 E., M.D.M., 1 mi. N of Mokelumne Hill	Not determined	Vein in slate and greenstone strikes NW and dips NE.	Long idle. Worked through 150-ft. shaft. (Kerr 00.)
	Gladstone	Sec. 7, T. 3 N., R. 14 E., M.D.M., ½ mi. SW of Murphys	Not determined	Vein in mica schist strikes NW and dips NE.	Active around 1896. Developed by 125-ft. adit. (Crawford 96: 105.)
B-151	Glencoe	S½ sec. 17, T. 6 N., R. 13 E., M.D.M., by South Fork Mokelumne River 1½ mi. NW of Glencoe	S. M. Haslett, 60 California St., San Francisco	N-striking vein in mica schist and slate.	Active 1870s and 1880s. Ore treated in 10-stamp mill. Developed by adit. (MSP 2/18/-71:100; 9/10/81:170; Kerr 00.)
	Glencoe group (Mexican, RidgeView, Sierra King, Sierra Queen, Stoetzer, Valentine)	Secs. 19, 20, 30, T. 6 N., R. 13 E., M.D.M., in Valentine Gulch 1 mi. N of Glencoe	Haslett Warehouse Co., 680 Beach St., San Francisco 9	.....	Consolidation of Valentine, Mexican, Sierra King, Sierra Queen, RidgeView, and Stoetzer claims, which were worked 1870s and 1880s; prospected 1930s. Ore treated in 20-stamp mill. See under each mine. (Tucker 16: 81.)
	Gloy	Sec. 7, T. 4 N., R. 13 E., M.D.M., 3 mi. SW of Mountain Ranch	Not determined	Two veins as much as 8 ft. thick with abundant sulfides strike NW and dip NE; slate and limestone country rock.	Long idle. Worked through 50-ft. adit. (Kerr 00.)
B-152	Gold Bug	Sec. 25, T. 7 N., R. 13 E., M.D.M., at Skull Flat 3 mi. NE of West Point	C. R. Kenyon, West Point (1936)	Vein in granodiorite strikes N.	Long idle; developed by shaft.
B-153	Gold Cliff	SE¼ sec. 33, T. 3 N., R. 13 E., M.D.M.	Utica Mines, Inc., 220 Montgomery St., San Francisco	.....	(MSP 10/27/83:260; Brown 90: 150; Fairbanks 90:60; MSP 7/9/92:28; Crawford 94:92-93; 96:105; Kerr 00; Ransome 00:9; Storms 00:111; MSP 11/12/10:652; Tucker 16:81-82; Hamilton 20:17; Minerals Yearbook 20; Logan 21:422; Knopf 29:71-72; Logan 35: 140-141; Julihn 38:136; Bowen 48:56; herein.)
	Gold Cliff	Sec. 25, T. 4 N., R. 13 E., M.D.M., 2 mi. E of Fricot Ranch	Sam Vukovich, Jackson (1936)	A 4-ft. vein in slate strikes W and dips N.	Long idle. Developed by open cut. (Kerr 00.)
	Golden Eagle	SW¼ sec. 9, T. 4 N., R. 14 E., M.D.M., 1 mi. E of Sheep Ranch	G. D. Martin, Sheep Ranch	Vein in quartz-mica schist strikes NE.	Active prior to and during middle 1920s. Developed by 100-ft. shaft. (Kerr 00; Logan 24:5.)
	Golden Fleece	T. 6 N., R. 13 E., M.D.M., 3 mi. SW of West Point	Vernon Striker, Railroad Flat (1936)	Vein in granodiorite strikes N.	Prospected 1932-36. Ore treated in 2- and 5-stamp mills. (Logan 36:261.)
	Golden Gate	.....	.....	.....	See Commodore.
B-154	Golden Hill	Sec. 1, T. 4 N., R. 11 E., M.D.M.	Lookout Mountain Mining Co., 33 California St., San Francisco	.....	(MSP 3/3/77:133; Crawford 96: 106; Kerr 00; Logan 36:270; Julihn 38:127; herein.)
B-155	Golden Reef	NE¼ sec. 25, T. 4 N., R. 13 E., M.D.M., 3 mi. N of Murphys by Indian Creek	Dora Gold Mining Co., 243 Geary St., San Francisco (1936)	Vein in quartz-mica schist strikes W and dips N.	Long idle. (Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-156	Golden Rule....	Sec. 12, T. 6 N., R. 13 E., M.D.M.			
	Golden Sherer...	.....	.....	.....	See A. V. G.
	Golden Slipper..	Sec. 30, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Altaville	Not determined.....	Vein in slate strikes NW and dips NE.	Long idle. Worked through 175-ft. adit. (Kerr 00.)
	Golden Star.....	Sec. 16, T. 4 N., R. 13 E., M.D.M., 2 mi. N of Fricot School	Not determined.....	Vein as much as 11 ft. thick in slate strikes NW and dips NE.	Long idle. Worked through 40-ft. shaft. (Kerr 00.)
B-157	Golden Star.....	SW¼ sec. 2, T. 2 N., R. 13 E., M.D.M., 2 mi. SE of Angels Camp	Not determined.....	Vein zone as much as 40 ft. thick in greenstone strikes NW, dips NE; on Mother Lode.	Long idle. Worked through 70-ft. shaft and 120-ft. adit. (Kerr 00.)
	Golden State....	Sec. 35, T. 6 N., R. 13 E., M.D.M., near Rich Gulch	Not determined.....	A 4- to 12-ft. vein in granite with abundant sulfides strikes N and dips 45° W.	Long idle. Worked through 50-ft. shaft. (Kerr 00.)
B-158	Golden Sulphuret	Sec. 12, T. 13 N., R. 14 E., M.D.M., in Colliersville district 5 mi. E of Murphys and just N of Stanislaus River by Camp 9 road	Helen Hunter Monihan and Geraldine Hunter, Alta Mira Hotel, Sausalito (1936)	White to gray quartz vein in micaceous slate and quartzite strikes W and dips steeply N.	Long idle; may have been prospected in 1930s. Developed by several open W drift adits.
	Golden West....	Sec. 24, T. 4 N., R. 13 E., M.D.M., 2 mi. SW of Sheep Ranch	Not determined.....	Two 4-ft. veins in slate strike NW and dip NE.	Active early 1900s. Worked through 350-ft. adit. (Kerr 00.)
	Gold Galena....	.....	.....	.....	See Galena-Gold.
B-159	Gold Hill.....	NW¼ sec. 18, T. 3 N., R. 14 E., M.D.M., 2 mi. S of Murphys	Julius J. Sirvain et al., Box 495, Clearlake Highlands	Vein in mica schist strikes NW and dips NE.	Discovered 1857; active 1860s, 1880s, and 1933-39. Developed by 110-ft. shaft and 3 adits, 190, 500, and 400 ft. in length. (MSP 10/11/66:294; 4/13/83:252; Tucker 16:82; Logan 36:260.)
B-160	Gold Hill.....	NW¼ sec. 32, T. 3 N., R. 13 E., M.D.M.	Charles C. Crespi et al., Angels Camp	.....	(MSP 7/9/92:28; Preston 93:171; MSP 3/17/94:173; Crawford 94:93; 96:105-06; Kerr 00; Logan 36:242; herein.)
B-161	Gold Hill.....	Sec. 11, T. 2 N., R. 13 E., M.D.M.			
B-162	Gold King.....	E½ sec. 26, T. 6 N., R. 14 E., M.D.M., 2 mi. W of Blue Mountain by Licking Fork Mokelumne River	J. T. Jones, Railroad Flat (1938)	A vein in greenstone and metadiorite strikes N. 60° W.	Active prior to and during late 1930s; last operator Blue Mountain Gold Mining Co. Developed by open 214-ft. drift adit and 75-ft. winze. (Logan 36:261.)
	Gold King.....	Sec. 22, T. 5 N., R. 11 E., M.D.M., 3 mi. SW of Mokelumne Hill	Not determined.....	On Mother Lode. A 4-ft. vein in diorite.	Active 1883. Developed by shaft and adit. (MSP 10/13/83:228; Kerr 00.)
B-163	Gold Knoll.....	N½ sec. 32, T. 2 N., R. 12 E., M.D.M.	Louis Cereghino, c/o Fred Seitz, 1540 Carol Ave., Burlingame	.....	(Logan 36:260; herein.)
B-164	Gold Metal.....	NE¼ sec. 24, T. 2 N., R. 11 E., M.D.M., 2 mi. NW of Hodson and 1 mi. NW of Mountain King mine	Not determined.....	A 5-ft. vein of quartz stringers and pyritic chlorite-sericite schist strikes N. 15° W. and dips 70° SW.	Long idle. Developed by several open inclined shafts and open cuts.
	Gold Reserve Cons.	.....	.....	.....	See Bruner.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
165	Gold Standard...	NW¼ sec. 17, T. 3 N., R. 11 E., M.D.M., 5 mi. E of Jenny Lind	Not determined.....	Vein in greenstone strikes NW and dips NE.	Long idle.
-166	Gold Star (Anderson Flat, Tolman)	Sec. 18, T. 6 N., R. 14 E., M.D.M., 4 mi. SE of West Point	R. F. Funston, West Point (1936)	A 4-ft. vein in granodiorite strikes N and dips E; rich in sulfides, ore averaged up to $53 per ton.	Discovered 1858; active 1870s, 1935-36; prospected 1946 by Dollar Hill Mining Co. Developed by 145-ft. vertical shaft with level at 110 ft. and 140-ft. drift. (MSP 8/1/74:68; 6/26/77:213; Logan 36:261; herein.)
	Gold Valley....	SW¼ sec. 32, T. 3 N., R. 13 E., M.D.M., 1 mi. W of Angels Camp	Mary Louise Tiscornia, c/o A. A. Tiscornia, 436 Kearney St., San Francisco 8	Vein in green schist strikes NW, and dips NE.	On Mother Lode. Active prior to 1895. Developed by shaft. (MSP 6/29/95:414; Crawford 96:106; Kerr 00.)
	Good Hope....	Sec. 6, T. 5 N., R. 12 E., M.D.M., 1 mi. NE of Mokelumne Hill	Not determined.....	A 3-ft. vein in slate strikes NW and dips NE.	Long idle. Worked through 150-ft. shaft and several adits. (Kerr 00.)
-167	Good Hope.....	NE¼ sec. 19, T. 6 N., R. 13 E., M.D.M., 1 mi. due N of Glencoe	Myrtle Rader et al., Glencoe	A 1- to 3-ft. vein in mica schist and slate strikes N.	An extension of San Bruno mine. Active 1870s. Developed by adit and shaft. See also San Bruno mine. (MSP 11/25/71:324; 1/13/72:20.)
	Good Hope Group	Secs. 19, 20, T. 6 N., R. 13 E., M.D.M., 1 mi. N of Glencoe	Myrtle Rader et al., Glencoe	.....	Included Good Hope, Monte Cristo, Oriental, and San Bruno claims. See also Good Hope and San Bruno. (Tucker 16:82.)
	Good Hope, Sunrise and Calaveras Queen	Secs. 18, 19, T. 6 N., R. 14 E., M.D.M., on ridge between South Fork and Licking Fork of Mokelumne River	Not determined.....	Series of N-striking, 65° E-dipping quartz veins in slate and mica schist.	Active around 1914. Developed by 100-ft. shaft and 2 adits 340 and 120 ft. in length. (Tucker 16:82.)
-168	Good Luck.....	NW¼ sec. 32, T. 6 N., R. 14 E., M.D.M., 3 mi. E Railroad Flat	Harry C. Bosse, Railroad Flat	Vein in schist strikes N.....	Active around 1921. Vein developed by crosscut adit and drift. Ore treated in 2-stamp mill. (Hamilton 22:26.)
-169	Gopher.....	Sec. 19, T. 2 N., R. 14 E., M.D.M.			
-38	Gopher Hill.....	Sec. 10, T. 1 N., R. 11 E., M.D.M., 2 mi. N of Telegraph City by Buckhorn Creek	H. L. Donner, Milton...	A 1½-ft. quartz vein in pyritized greenstone strikes NW and dips NE; ore is base with considerable silver. Ore mined in 1930s yielded $9 per ton.	Gold and copper mine. Active 1921 and 1934-36. Developed by 84-ft. shaft with levels at 40 and 80 ft. See also under Copper. (Logan 36:262.)
	Gospel.....	.....	.....	.....	See Kate Hageman.
-170	Gottschalk.....	SW¼ sec. 7, T. 4 N., R. 12 E., M.D.M., 1½ mi. NW of San Andreas	Mrs. C. V. Gottschalk Estate, c/o C. T. Shinn, 2684 Marty Way, Sacramento	On Mother Lode. A 2- to 20-ft. vein strikes NW, and dips NE; slate footwall and amphibolite hanging wall; also several E-striking veins.	Active prior to and during 1890s. Developed by 492-ft. shaft, a 500-ft. adit on 192-ft. level and a 200-ft. drift on 100-ft. level. (MSP 8/31/95:135, Crawford 96:106-107; Kerr 00; Tucker 16:83; Logan 36:262.)
	Gould.....	Sec. 14, T. 2 N., R. 13 E., M.D.M., near town of Carson Hill	Not determined	Vein strikes N. 45° W. and dips 65° NE.	Active around 1914. Developed by 75-ft. shaft and 250-ft. adit. (Tucker 16:83.)
	Grace Darling...	Sec. 27, T. 4 N., R. 13 E., M.D.M., near Fricot School	Not determined.....	Several W-striking veins in slate and schist.	Long idle. Worked through 215-ft. adit and 195-ft. shaft. (Kerr 00.)
	Graham.....	.....	.....	.....	See Big Spring.
	Grand Prize.....	Sec. 13, T. 6 N., R. 13 E., M.D.M., 2 mi. SE of West Point	Grand Prize Mining Co., West Point	Vein in granodiorite strikes N and dips W; abundant sulfides.	Now being prospected. Developed by 260-ft. adit.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-171	Granite	SE¼ sec. 33, T. 7 N., R. 13 E., M.D.M., 2 mi. NE of West Point	Forrest L. Johnstone, 35 Garces Dr., San Francisco 27	A 4-ft. vein in granite strikes NE and dips SE.	Active 1870s and 1896. Developed by 130-ft. shaft. Ore treated in 5-stamp mill. (MSP 4/14/77:229; 4/25/96:342; Kerr 00.)
B-172	Grasshopper	NW¼ sec. 4, T. 2 N., R. 14 E., M.D.M., 3 mi. SE of Vallecito	Not determined	A 3-ft. vein in quartz-mica schist strikes NW and dips NE.	Active around 1914. Developed by upper 360-ft. and lower 200-ft. adits. (Tucker 16:83).
	Grasshopper				See Banner.
	Gray	Sec. 23, T. 7 N., R. 13 E., M.D.M., on ridge SE of North Fork Mokelumne River, 4 mi. NE of West Point	Not determined	Vein in granodiorite strikes N; abundant sulfides.	Active prior to 1914. Developed by 200-ft. crosscut and 100-ft. drift adits. (Tucker 16:83.)
B-173	Great Divide	E½ sec. 1, T. 3 N., R. 13 E., M.D.M., 2 mi. NW of Murphys	Robert A. Zarick, Murphys	Two parallel veins in mica schist and graphitic slate strike W and dips N.	Active prior to 1914, 1935-38 in conjunction with adjoining Last Chance mine, and prospected 1957. Developed by two open shallow shafts. See also Last Chance. (Logan 36:267-268.)
	Great Western				See Western.
B-174	Great Western	S½ sec. 28, T. 3 N., R. 13 E., M.D.M., at Altaville	Irene G. Lee and James H. Lee, 1745 Cayuga Ave., San Francisco	On Mother Lode. A 6- to 20-ft. vein in slate and greenstone strikes NW and dips NE.	Active in 1896-97. Developed by 220-ft. shaft with 3 levels. Ore treated in 5-stamp mill. (MSP 11/21/96:426; Kerr 00; Storms 00:120; Logan 35:141.)
B-175	Greek	W½ sec. 14, T. 4 N., R. 13 E., M.D.M., ½ mi. NW of Cave City	Not determined	Vein in quartz-mica schist strikes N. Limestone to E and W.	Long idle.
	Greek				See Alpha & Omega.
	Greenstone				See Tryon.
	Guadaloupe				See Homestead.
	Guiffra	SE¼ sec. 12, T. 5 N., R. 11 E., M.D.M., on Stockton Ridge, at Mokelumne Hill	Marie Nuner, Mokelumne Hill	Vein in schist strikes N.	Active 1902. Developed by 105-ft. shaft. Ore treated in 10-stamp mill. (MSP 7/12/02:26; Tucker 16:84.)
B-176	Gumboot	SE¼ sec. 26, T. 4 N., R. 13 E., M.D.M., 2 mi. NE of Esmeralda School by Indian Creek	William Nuner, San Andreas (1936)	Vein in mica schist and slate strikes W and dips N.	Active during gold rush with substantial output and again about 1905. Developed by 700-ft. adit and shaft. (MSP 8/26/05:145; Logan 36:262.)
B-177	Gwin	Secs. 15, 16, 21, 22, 27, 28, T. 5 N., R. 11 E., M.D.M.	Gwin Mine Development Co., c/o J. A. Levensaler, 233 Sansome St., San Francisco		(MSP 3/18/71:163; 5/23/74:326; 6/6/77:383; Irelan 87:30-34; Fairbanks 90:67; Crawford 94:93; MSP 12/9/94:362; 9/14/95:168; Crawford 96:107-08; MSP 4/23/98:437-440; Kerr 00; Ransome 00:8; Storms 00:100-104; Tucker 16:84-85; Minerals Yearbook 27; Logan 35:141-42; 38:136; herein.)
B-178	Hale				See Angels Deep. (Fairbanks 90:60; Brown 90:147-48; Crawford 94:93.)
B-179	Hamby	N½ sec. 24, SW¼ sec. 23, T. 5 N., R. 11 E., M.D.M., 4 mi. SW of Mokelumne Hill	Robert Gallagher, Valley Springs	Ore body 10 to 20 ft. wide, in quartz vein and stringers, strikes NW and dips NE; greenstone footwall, slate hanging wall.	Active prior to and during 1900-16. Developed by 300-ft. vertical shaft, crosscuts, and drifts. Ore treated in 20-stamp mill with Frue vanners. (Kerr 00; MSP 11/12/04:330; 7/1/16:27; Tucker 16:85-86.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-180	Hancock and Tibbits	SE¼ sec. 10, T. 5 N., R. 11 E., M.D.M., near Middle Bar bridge, 2½ mi. NW of Mokelumne Hill	East Bay Municipal Utility District, Oakland	On Mother Lode. A NW-striking vein in greenstone and slate developed by crosscut adit and open cut.	Long idle. (Crawford 96:108; Kerr 00; Tucker 16:86.)
B-181	Hardscrabble (Bull Frog)	NE¼ sec. 6, T. 4 N., R. 13 E., M.D.M., on ridge above Murray Creek 2 mi. W of Mountain Ranch	Louis Bauer, Camp Tamarack (1936)	Two narrow veins in slate strike E and dip S. Ore yielded up to $30 per ton.	Unpatented claim. Active 1928 and 1936. Developed by 100- and 40-ft. shafts and 300-ft. adit. (Logan 36:262-63.)
B-182	Hardy (McCreight)	S½ sec. 11, N½ sec. 14, T. 2 N., R. 13 E., M.D.M., on N slope Chaparral Hill 3 mi. S of Angels Camp	Utica Mines et al., 220 Montgomery St., San Francisco	On Mother Lode. Quartz vein with abundant sulfides in diorite and slate strikes NW and dips NE.	Intermittently active from 1880s to 1923. Developed by 170-ft. shaft and 360-ft. adit. (MSP 6/23/88:396; Preston 93:174; Crawford 94:93; 96:112; Kerr 00; Tucker 16:86; Logan 25:154; Logan 35:142.)
	Hardy				See Bolitha.
	Harris mill	3 miles S of West Point.	J. H. Thompson Ranch, West Point (1936)		Custom mill that operated from 1860s to 1883. Tailings treated in plant containing ball mill and classifiers owned by Dr. A. J. Maurer of Oakland in 1935-36. (Logan 36:290.)
	Harris				See Oriole.
	Haskins				See Champion.
B-183	Hawkins	SW¼ sec. 34, T. 6 N., R. 12 E., M.D.M., in Rich Gulch area 6 mi. NE of Mokelumne Hill	Carl and Violet Dell'Orto et al., Mokelumne Hill	A number of veins in granodiorite.	Active prior to and during 1920s. Developed by open cuts and adits. (Logan 25:154.)
B-184	Hazel Dell	SE¼ sec. 8, T. 5 N., R. 13 E., M.D.M., 4 mi. SW of Railroad Flat in Hazel Dell Gulch	Not determined	Vein in mica schist and slate strikes N.	Long idle. Developed by adit.
B-185	Hazel Emma	SE¼ sec. 27, T. 5 N., R. 13 E., M.D.M., in Mexican Gulch, 1½ mi. NE of Mountain Ranch	George W. Carr Jr., Mountain Ranch (1936)	A ½- to 2½-ft. vein in slate strikes W and dips N. Ore yielded $20 per ton.	Active early 1930s. Developed by 175-ft. N crosscut adit, 100 ft. of drifts, and 40-ft. winze. (Logan 36:263.)
B-186	Heckendorn (Blue Mountain)	SE½ sec. 18, T. 6 N., R. 15 E., M.D.M., 12 mi. E of West Point by Licking Fork of South Fork Mokelumne River	W. H. Gardner, 901 S. Windsor Blvd., Los Angeles 19	Main vein strikes N and dips W; two other intersecting veins; granodiorite, diorite, and gneiss country rock.	Discovered 1863; active 1860s and 1870s; operated 1935-36 by owner. Main vein developed by 50-ft. shaft, drifts, and open cut. Ore treated originally in 10-stamp mill. (MSP 5/14/64:325; 3/24/66:178; 4/4/74:213; Kerr 00; Logan 36:263-64; Minerals Yearbook 36; Julihn 38:130-31; Eric 48:220.)
B-187	Helen	SW¼ sec. 13, T. 4 N., R. 11 E., M.D.M., 2 mi. W of San Andreas	Rosa Casinelli, 1059 Longridge Road, Oakland (1936)	Vein in slate and greenstone strikes NW and dips NE.	Long idle. Developed by shaft.
	Hercule	Secs. 24, 25, T. 4 N., R. 13 E., M.D.M., on ridge between San Antonio and Indian Creeks, 5 mi. N of Murphys	E. G. Staples, Mountain Ranch (1936)	Vein in quartz-mica schist strikes N.	Active 1889 to about 1904; worked by E. G. Staples in 1941. Developed by 200-ft. and 160-ft. shafts. (MSP 4/20/89:276; Crawford 96:108; Tucker 16:86; Logan 36:249-250.)
B-188	Hicks	Sec. 10, T. 2 N., R. 13 E., M.D.M.			

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Hicks	T. 2 N., R. 12 E., M.D.M., in Salt Spring Valley, 4 mi. NW Copperopolis	Not determined	Quartz vein in slate	Prospected around 1896. Developed by crosscut adit and 130-ft. shaft. (Crawford 96:108.)
	Hicks				See California.
B-189	Hidden Treasure	NE¼ sec. 1, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Murphys	Thomas F. Denslow et al., c/o Mrs. Robert Barron, 2801 23d Ave., Sacramento	W-striking vein in slate and mica schist; abundant sulfides.	Active intermittently 1925-39. Ore cyanided. (Logan 36:264.)
B-190	Hidden Treasure	Sec. 8, T. 3 N., R. 14 E., M.D.M.			
B-191	Hill Top	SW¼ sec. 29, T. 4 N., R. 14 E., M.D.M., 3 mi. N of Murphys	Not determined	White to gray quartz vein with sulfides strikes NW and dips NE; micaceous slate country rock.	Active many years ago; now being prospected. Developed by two short N-crosscut adits.
	Hobo	Secs. 19, 30, T. 2 N., R. 12 E., M.D.M. Near Hodson; adjoins Royal and Mountain King mines	Jackson D. McCarty estate, Copperopolis	Vein in greenstone and slate strikes NW, dips NE.	Consists of Hill Top and Mauritas claims. Prospected 1930-31. (Logan 36:264.)
	Hog Pen	Sec. 33, T. 3 N., R. 13 E., M.D.M., in Angels Camp	Not determined	Several veins as much as 7 ft. thick in slate and greenstone strike NW and dip NE. On Mother Lode.	Active 1897. Developed by 50-ft. shaft and 230-ft. adit. (MSP 11/6/97:434; Kerr 00.)
B-192	Holland	S½ sec. 20, N½ sec. 29, T. 4 N., R. 12 E., M.D.M., 1 mi. S of San Andreas	Not determined	An 8- to 16-ft. vein strikes NW, dips NE and has slate hanging wall and greenstone footwall. On Mother Lode.	Active 1896. Developed by 500-ft. crosscut adit. Ore treated in Huntington mill. (Crawford 96:108; Kerr 00; Tucker 16:86.)
	Holmes	Sec. 20, T. 6 N., R. 13 E., M.D.M., 1 mi. NE of Glencoe	Not determined	A 3-ft. quartz vein in granodiorite strikes N. 20° W. and dips 50° W.	Active 1870s. Developed by 375-ft. adit. Ore treated in 10-stamp mill. (MSP 11/24/77:322; Tucker 16:86.)
	Holmes				See Janie Boyd.
B-193	Holy Ghost	Sec. 34, T. 3 N., R. 13 E., M.D.M.			
	Homestake	Sec. 1, T. 3 N., R. 14 E., M.D.M., 5 mi. E of Murphys	Not determined	High-grade pockets in E-striking quartz veins and lenses in mica schist.	Active 1890s and 1938-42. (Crawford 94:93; 96:108; Tucker 16:87.)
	Homestake				See Dora and Homestake.
	Homestead (Guadaloupe)	T. 6 N., R. 13 E., M.D.M., 1¾ mi. SE of Glencoe	Not determined	Granodiorite country rock	Active 1866 and 1893. (MSP 12/1/66:342; Crawford 94:94; 96:108.)
	Hoosier				See Shenandoah.
B-194	Hostler	NW¼ sec. 3, T. 4 N., R. 13 E., M.D.M., 1 mi. NE of Mountain Ranch	W. R. O'Connell, San Andreas (1936)	Vein in quartz-mica schist strikes N.	Long idle. Developed by adit.
B-195	Hub	NW¼ sec. 9, T. 3 N., R. 14 E., M.D.M., 1 mi. SE of Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N.	Long idle. Developed by shaft.
B-196	Hudson	SE¼ sec. 11, T. 4 N., R. 11 E., M.D.M., by Latimer Gulch 2 mi. W of San Andreas	Maria Macchiavello, 1754 Great Highway, San Francisco	A 3- to 5-ft. vein in slate and greenstone strikes N. 45° W. and dips NE.	Extensively mined in 1870s; active around 1893; prospected 1928-29. Developed by open 300-ft. shaft, 100-ft. shaft and open cuts. (MSP 3/30/72:196; Crawford 94:94; 96:109; Kerr 00; Tucker 16:87.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
-197	Humming Bird...	Sec. 5, T. 6 N., R. 13 E., M.D.M.			
-198	Hurricane.....	Sec. 18, T. 4 N., R. 14 E., M.D.M.			
	Idaho Consolidated	Sec. 27?, T. 4 N., R. 13 E., M.D.M., near Fricot Ranch	Desire J. Fricot, Angels Camp (1936)	Veins in mica schist strike NW, dip NE.	Active prior to 1914. Developed by adits. (Kerr 00; Tucker 16:87.)
	Idora.....	Sec. 5, T. 5 N., R. 12 E., M.D.M., 2 mi. NE of Mokelumne Hill	Not determined.....	Two series of veins strike N...	Prospected prior to 1914. (Tucker 16:87.)
	Ike Citron.....	Sec. 36, T. 4 N., R. 11 E., M.D.M., 2 mi. SW of Kentucky House	Not determined.....	Two veins as much as 10 ft. thick in greenstone strike NW and dip NE.	Active early 1900s. Worked through 125-ft. adit. (Kerr 00.)
3-199	Ilex..... (Anglo-Saxon, Tiger)	SE¼ sec. 35, T. 6 N., R. 12 E., M.D.M.	W. W. Steele and Julius Podesta, Jackson	.....	(MSP 3/21/68:182; 3/28/68:198; 6/16/77:197; Irelan 88:135-38; Crawford 94:94; Turner 94:9; Kerr 00; Logan 36:264-65; herein.)
3-200	Illinois	N½ sec. 16, T. 3 N., R. 12 E., M.D.M., 6 mi. S of San Andreas	Lurline Tilden, 626 S. Spring St., Los Angeles (1936)	Two veins, one striking N. 5° E., and the other N. 30° W.; slate and schist country rock.	Active 1889 to 1900. Developed by 200-ft. inclined shaft with 2 levels. Ore treated in 10-stamp mill. (Brown 90:149; MSP 7/23/92:69; Crawford 94:94; 96:109; Kerr 00; Storms 00:107; Tucker 16:87; Logan 35:148.)
	Independence..	T. 4 N., R. 14 E., M.D.M., 3½ mi. N of Murphys	Charles Marcum et al., Murphys (1936)	A 5-ft. vein in slate strikes NW and dips NE; contains $9 ore.	Long idle. Developed by 55-ft. vertical shaft and 240-ft. adit. (Logan 36:265.)
	Independence...	.....	.....	.....	See Carson Hill.
B-201	Ingomar.....	SW¼ sec. 35, T. 5 N., R. 10 E., M.D.M., 1½ mi. NE of Campo Seco	Arnoldo Moss, San Jose (1936)	A 10-ft. vein with free gold and sulfides strikes N. 30° W. and dips 60° NE; amphibolite and talc schist country rock.	Active during gold rush; prospected 1935-36 by Joe Nunez. Developed by 500-ft. inclined shaft with levels at 300, 380, and 500 ft. and SW crosscut adit. (Logan 36:265; Eric 42:220.)
B-202	Iron Rock.....	SE¼ sec. 14, T. 2 N., R. 13 E., M.D.M.	Fred G. Stevenot, 300 Montgomery St., San Francisco	.....	See Carson Hill. (Crawford 94:94; 96:109; MSP 11/9/95:306; Kerr 00; Tucker 16:87.)
	Isabel.....	Sec. 30, T. 3 N., R. 14 E., M.D.M., ½ mi. W of Vallecito	Not determined.....	Vein in quartz-mica schist...	Active around 1914. Developed by 75-ft. shaft. (Tucker 16:88.)
B-203	Jackson.....	W½ sec. 13, T. 4 N., R. 11 E., M.D.M., near Highway 12, 3 mi. NW of San Andreas	Not determined.... ...	Vein in slate strikes NW and dips NE; several intersecting veins.	Intermittently worked for pockets from about 1896 to 1913. (Crawford 96:109; Tucker 16:88.)
	Jackson.....	.....	.....	.....	See Utica.
	Janie Boyd (Holmes, Sanchez)	Secs. 2, 11, T. 4 N., R. 10 E., M.D.M., ½ mi. SE of Campo Seco	Wm. Arbunarus, Campo Seco (1936)	Series of parallel quartz and calcite veins in greenstone and slate contains free gold and sulfides.	Active prior to and during 1935-36; also placer mined. Developed by 500- and 185-ft. SE adits. (Tucker 16:57; Logan 36:265-266.)
B-204	Jasper.....	Sec. 13, T. 6 N., R. 13 E., M.D.M.			
	Jenkins.....	T. 4 N., R 14 E., M.D.M., 1 mi. SW of Sheep Ranch	Not determined.....	A 2- to 4-ft. vein in schist...	Prospected in 1896. (Crawford 96:109.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Jersey	Sec. 26, T. 4 N., R. 11 E., M.D.M., 4 mi. SW of San Andreas	C. C. Moller estate, c/o Mrs. A. M. Moller, Valley Springs (1936)	Two veins as much as 10 ft. thick in slate and greenstone strike NW and dip NE.	Active early 1900s. Worked through 125-ft. adit. (Kerr 00.)
B-205	John Henry	NE¼ sec. 2, T. 6 N., R. 13 E., M.D.M., 1½ mi. NE of West Point	Not determined	Vein in granodiorite strikes N and dips W; abundant sulfides.	Long idle. Developed by shaft.
	Johnston	T. 6 N., R. 13 E., M.D.M., 1 mi. NW of West Point	M. Donnallon, West Point (1936)	A 4-ft. vein in granodiorite strikes N and dips 55° W.	Operated 1934-36 by L. G. Johnston of Los Angeles. Developed by 110-ft. inclined shaft with levels at 50 and 100 ft. (Logan 36:266.)
	Jolly Tar				See Fazzi.
	Jones	Sec. 25, T. 6 N., R. 13 E., M.D.M., 2 mi. E of Glencoe	M. H. Manuel, Murphys	Vein in quartz-mica schist strikes N.	Active prior to and during 1895. Developed by 200-ft. shaft. (Crawford 96:109.)
	Jones				See Carson Creek.
	Jumbo				See Empire.
	Jumper (Rose Rock)	Sec. 29, T. 4 N., R. 14 E., M.D.M., N of San Domingo Creek; 4½ mi. N of Murphys	Not determined	A 1½-ft. vein in mica schist with dike strikes NE and dips NW; quartz is white to blue.	Active 1890s. Developed by upper 150- and lower 230-ft. adits. (Crawford 96:117; Kerr 00; Tucker 16:88.)
B-206	Kaiser Wilhelm	SE¼ sec. 32, T. 6 N., R. 13 E., M.D.M., 3 mi. SE of Glencoe	Alma Investment Co., 1257 Shrader St., San Francisco 17	Vein in slate and mica schist strikes N.	Active in 1880s, again in 1935. Developed by 150-ft. vertical shaft and 300-ft. adit. (MSP 10/29/81:282; Kerr 00; Logan 36:266.)
	K. and J.	NW¼ sec. 34, T. 4 N., R. 13 E., M.D.M., ¼ mi. N of Esmeralda School and just W of Esmeralda mine	D. C. Demarest and C. E. Gibson, San Andreas	Vein in mica schist and slate strikes W and dips N.	Long idle. Developed by 100-ft. shaft and 150-ft. N crosscut adit. (Kerr 00; Tucker 16:88.)
B-207	Kate Hagemen (Comet, Gospel)	S½ sec. 6, N½ sec. 7, T. 4 N., R. 12 E., M.D.M.	Delaray Mines, Inc., et al., c/o John Numoz, Mokelumne Hill		(MSP 5/10/73:292; 2/21/85: 128; Crawford 96:101; Kerr 00; Tucker 16:74, 82; Logan 36:267; Minerals Yearbook 37, 38, 40, 41; herein.)
	Kelly	T. 4 N., R. 13 E., M.D.M., 3½ mi. W of Sheep Ranch	Not determined	Vein in quartz-mica schist	Active prior to 1896. Developed by 180-ft. adit. (Crawford 96: 109.)
B-208	Keltz	S½ sec. 24, T. 7 N., R. 13 E., M.D.M.	Julia B. Higgens, Mount Kisco, N. Y.		(MSP 6/6/85:368; Crawford 94: 94; 96:110; Kerr 00; Tucker 16:88; Hamilton 22:27; Logan 23a: 19; 23c: 17-18; herein.)
	Kenross	Secs. 11, 12, T. 5 N., R. 12 E., M.D.M., on ridge W of Esperanza Creek, 5 mi. E of Mokelumne Hill	Not determined		Active as hydraulic and lode mine prior to 1914. (Tucker 16:88.)
	Kentucky				See Carson Hill.
	Kentucky House	Sec. 29, T. 4 N., R. 12 E., M.D.M., near Kentucky House	Not determined	Vein in slate strikes NW and dips NE.	Active during 1890s. Developed by 160-ft. shaft. (Crawford 94: 94; 96:110; MSP 5/9/96: 382; Kerr 00; Tucker 16:88.)
	Keystone	Sec. 5, T. 5 N., R. 12 E., M.D.M., 2 mi. NE of Mokelumne Hill	Not determined	Vein zone as much as 30 ft. thick strikes N.	Active early 1900s. Worked through 160-ft. adit. (Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
3-209	Keystone	N½ sec. 29, T. 3 N., R. 13 E., M.D.M., 1 mi. NW of Altaville by Highway 49	John Malaspina, Altaville (1936)	On Mother Lode. Quartz vein with pyrite strikes N. 55° W. and dips NE; green schist footwall and phyllite hanging wall.	Long idle. Developed by open vertical shaft.
	Keystone	Secs. 25, 26, 35, T. 6 N., R. 13 E., M.D.M., at Railroad Flat	Delbert Seeman, Railroad Flat	Vein with abundant sulfides in mica schist strikes N.	Active prior to and during 1890s, and in 1917. Developed by 100-ft. shaft and drifts. (MSP 7/16/92:44; 8/11/17:215; Crawford 96:110.)
3-210	Keystone	S½ sec. 12, T. 3 N., R. 13 E., M.D.M., 2 mi. SW of Murphys	Not determined	Vein in quartz-mica schist strikes WNW and dips N.	Long idle. Developed by shaft.
	Keystone				See Carson Hill.
	Keystone				See Mohawk.
	Kidoo	T. 4 N., R. 14 E., M.D.M., on ridge between Indian and San Domingo Creeks, 2 mi. S of Sheep Ranch	Not determined	Vein in quartz-mica schist strikes NW and dips NE.	Active around 1914. Developed by 50-ft. shaft. (Tucker 16:88.)
	King Solomon	Sec. 1, T. 6 N., R. 13 E., M.D.M., 2½ mi. E of West Point	Carroll Evans et al., 1144 Yale St., Santa Monica (1936)	Narrow vein in granodiorite strikes N; sulfides abundant; several diorite dikes.	Active many years ago; prospected 1935-36. Developed by 140-ft. shaft. (Logan 36:255.)
	Kuhn				See Morning Star.
	La Fortuna				See Lucas.
	La France	Sec. 29, T. 2 N., R. 13 E., M.D.M., 5 mi. SW of Angels Camp	Not determined	Two veins 4 to 8 ft. thick in slate and greenstone strike NW and dip NE.	Active early 1900s. Worked through 65-ft. adit. (Kerr 00.)
3-211	Lamphear	Sec. 18, T. 5 N., R. 12 E., M.D.M.	Roanoke Mining Co., c/o Frank A. West, 311 E. Main St., Stockton 5		(MSP 4/7/66:210; 9/21/67:182; 11/5/81:300; 6/13/96:282; Kerr 00; Logan 23c:18; 24:76; 25:155; 36:267; herein.)
	Lamphyre	T. 4 N., R. 9 E., M.D.M., ¾ mi. NW of Comanche	Not determined	Vein in greenstone.	Active around 1896. Worked through a drain tunnel. (Crawford 94:94; 96:110.)
	Lane and Tulloch				See Madison.
	La Petite	Sec. 15, T. 5 N., R. 13 E., M.D.M., 3 mi. S of Railroad Flat	Not determined	A 1½-ft. vein in slate and greenstone strikes N. 22° W. and dips 80° NE.	Active prior to and in 1917. Developed by 100-ft. shaft and open cut. (Kerr 00; MSP 6/9/17:816.)
	Last Chance	Sec. 18, T. 4 N., R. 13 E., M.D.M., 3 mi. SW of Mountain Ranch	John Guth, Mountain Ranch (1936)	Vein in quartz-mica schist and slate.	Active prior to 1936. Developed by 75-ft. and 200-ft. adits. (Logan 36:267.)
-212	Last Chance	Sec. 24, T. 2 N., R. 13 E., M.D.M., on SE slope of Carson Hill adjoining South Carolina claim	Fred G. Stevenot, 300 Montgomery St., San Francisco		Active prior to 1894. See also Carson Hill. (Crawford 94:94; 96:110; Kerr 00.)
-213	Last Chance	SW¼ sec. 34, T. 3 N., R. 13 E., M.D.M., just S of Angels Camp, on Utica vein	Not determined	Vein in green schist strikes NW and dips NE; several rich pockets.	On Mother Lode. Active 1890s. Developed by 320- and 70-ft. shafts. (Crawford 96:110; MSP 11/20/97:486; Storms 00:122; Tucker 16:89.)
-214	Last Chance	NE¼ sec. 13, T. 3 N., R. 13 E., M.D.M., 2 mi. SW of Murphys	Innocent Calzasia estate, c/o Pauline Klein, 2417 E. Church St., Stockton (1936)	Vein in quartz-mica schist strikes W and dips N.	Long idle.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-215	Last Chance (Great Divide)	Sec. 1, T. 3 N., R. 13 E., M.D.M., 2 mi. NW of Murphys.	John Guastilli, Murphys	Two veins in mica schist strike W and dip N.	Active prior to 1914, 1935-38; in conjunction with adjoining Great Divide mine; prospected 1956. Developed by open 100-ft. shaft. Ore treated in mill. (Tucker 16:89; Logan 36: 267-268.)
B-216	Last Chance	NW1/4 sec. 25, T. 7 N., R. 13 E., M.D.M., at Skull Flat 3 mi. NE of West Point.	Not determined	Vein in granodiorite strikes N; abundant sulfides.	Long idle. Developed by shaft.
B-217	Last Chance	Sec. 32, T. 7 N., R. 13 E., M.D.M.			
B-218	La Verne	N1/2 sec. 20, T. 6 N., R. 13 E., M.D.M., 1/2 mi. E Glencoe.	J. S. Wright, 1608 Derby St., Berkeley (1936)	A 6-ft. vein strikes NE and dips SE; quartz-mica schist and slate country rock.	Prospected by J. A. Wright in 1936. Developed by 70-ft. crosscut adit and drift. (Logan 36:268.)
B-219	Lawson	Sec. 21, T. 6 N., R. 13 E., M.D.M.			
	Leader	Secs. 18 and 19, T. 3 N., R. 11 E., M.D.M., 4 mi. E of Jenny Lind	Not determined	Two 4-ft. veins in slate and gneiss strike NW and dip NE.	Long idle. Worked through shallow shaft. (Kerr 00.)
	Legal Tender	E1/2 sec. 24, T. 4 N., R. 13 E., and SW1/4 sec. 19, T. 4 N., R. 14 E., M.D.M. on ridge between Indian and San Antonio Creeks, 4 mi. NW of Murphys, near Bon Ton mine.	Orpha E. Stanley, c/o Jasper W. Moore, P.O. Box 522, Boron	Vein in mica schist strikes E and dips 80° S.	Active around 1895, 1912-14, and 1933. Developed by 110-ft. shaft and 2 crosscut adits. (Crawford 96:110; Kerr 00; MSP 4/16/12:513; Logan 36:268.)
B-220	Leonard	W1/2 sec. 8, T. 4 N., R. 12 E., M.D.M. on N side of Murray Creek, 2 mi. N of San Andreas.	E. C. and O. M. Leonard, Angels Camp	A vein in slate as much as 24 ft. thick strikes NW and dips NE.	Active 1888 to 1895. Developed by shaft and 400-ft. crosscut adit. Ore treated in 10-stamp mill. (MSP 8/4/88:72; Brown 90:151-152; Crawford 96:110; Kerr 00.)
	Le Roi	.....	.....	.....	See Easyz Bird.
	Lew Wallace	Sec. 10, T. 4 N., R. 12 E., M.D.M., 2 mi. NE of San Andreas	Not determined	Two 6-ft. veins in slate strike NW and dip NE.	Active 1900-04. Developed by adits. (Kerr 00; MSP 11/3/00: 510; 1/23/04:67.)
	Liberty Bell	Sec. 21, T. 6 N., R. 13 E., M.D.M., 2 mi. NW of Railroad Flat	W. T. Treat, San Andreas (1936)	Three parallel 1/2- to 6-ft. veins with slate footwall and granodiorite hanging wall strike N and dip E.	Consists of 5 claims. Active many years ago; prospected 1936 by Ed King. Developed by 80-ft inclined shaft. (Logan 36:268.)
B-221	Lightner	NE1/4 sec. 33, T. 3 N., R. 13 E., M.D.M.	B. F. Wellington, Jr., 409 Park Way, Piedmont 11	.....	(MSP 12/5/96:466; Crawford 96:110; Kerr 00; Ransome 00 9; Storms 00:109-111; MSP 2/4/11:208; Tucker 16:89-90 Logan 21:422; 35:143-44 191-192; herein.)
	Linderaxa	T. 5 N., R. 12 E., M.D.M., 1 1/2 mi. NE of Mokelumne Hill	T. J. Tynan, 355 Frederick St., San Francisco (1936)	A 1- to 10-ft. wide quartz vein in diorite and chlorite schist strikes NW.	Active 1889 to 1895. Developed by 400-ft. adit. Ore treated in 10-stamp mill. (MSP 9/9/93 173; Crawford 96:110-111.)
B-222	Lindsay (Black George, Machu, San Antonio)	W1/2 sec. 33, T. 3 N., R. 13 E., M.D.M., 1/2 mi. W Angels Camp	Utica Mines, Inc., 220 Montgomery St., San Francisco	Vein strikes NW and dips NE; greenstone hanging wall, slate footwall; on Mother Lode belt.	Discovered 1855, active 1882-8 and early 1900s. Developed by open cut and 100-ft. shaft (MSP 2/25/82:124; Brow 90:151; Fairbanks 90:60; Pres ton 93:174; Crawford 96:111 Kerr 00; Tucker 16:90.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
-223	Linnet	Sec. 5, T. 6 N., R. 13 E., M.D.M.			
-224	Littlefield	SE¼ sec. 8, T. 6 N., R. 13 E., M.D.M., just S of Middle Fork Mokelumne River 2½ mi. SW West Point	Arthur Kirst, Glencoe	N-striking parallel quartz veins and stringers in granodiorite contain free gold and abundant sulfides.	Intermittently worked since 1936 by owner with output of about $1,000. Developed by E crosscut adit and drifts. Ore treated in Huntington mill.
-225	Little Giant	Sec. 9, T. 5 N., R. 13 E., M.D.M.			
	Little Grove	Sec. 28, T. 5 N., R. 13 E., M.D.M., 3 mi. N of Mountain Ranch	Not determined	A 1½-ft. vein in slate strikes W and dips S.	Long idle. Worked through 250-ft. shaft and 200 ft. of drifts. (Kerr 00.)
	Little Gulch, etc.	Sec. 1, T. 6 N., R. 13 E., M.D.M., 2 mi. E of West Point	Carroll Evans et al., 1144 Yale St., Santa Monica (1936)	Series of parallel veins with abundant sulfides in granodiorite strike N and dip 80° W.	Includes Little Gulch, Opal, and Red Wonder claims. Active 1935-36. Developed by 90-ft. vertical shaft with levels at 45 and 90 ft. (Logan 36:268-269.)
	Little Hero	Sec. 3, T. 4 N., R. 13 E., M.D.M., on ridge SE of Corral Gulch near Mountain Ranch	Not determined	A 2-ft. vein in slate strikes NE and dips SE.	Unpatented claim. Active prior to 1900. Developed by 80-ft. shaft and 80-ft. adit. (Kerr 00; Tucker 16:90.)
	Little Nugget				See Utica.
	Little Star	Sec. 35, T. 4 N., R. 14 E., M.D.M., 4 mi. NE of Murphys	Not determined	Vein in quartz-mica schist.	Worked 1939-40 by J. L. Bairley of Murphys. Vein developed by 95-ft. vertical shaft. Ore treated in stamp mill. (U. S. Bureau Mines records).
	Live Oak	Sec. 30, T. 3 N., R. 11 E., M.D.M., 5 mi. E of Jenny Lind	Not determined	Three 2½-ft. veins in slate and and greenstone strike NW and dip NE.	Long idle. Worked through 40-ft. shaft and open cut. (Kerr 00.)
	Live Oak, No. 1, No. 2	Sec. 34, T. 5 N., R. 13 E., M.D.M., on ridge N of Corral Gulch, 1 mi. NE of Mountain Ranch	Not determined	Two E-striking veins in slate and quartzite.	Active 1898-1904. Developed by 150-ft. shaft and 200-ft. adit. Ore treated in 10-stamp mill. (MSP 6/11/98:621; 4/-30/04:303; Kerr 00; Tucker 16:90.)
B-226	Lockwood (Mina Rica)	NE¼ sec. 1, T. 6 N., R. 13 E., and NW¼ sec. 6, T. 6 N., R. 14 E., M.D.M.	Lockwood Cons. Gold Mining Co., 1834 Sutter St., San Francisco		(MSP 3/17/66:162; Irelan 88: 138-41; Turner 94:9; Crawford 96:111; Kerr 00; Tucker 16: 90-91; Logan 23a:19, 21; 36: 269; Minerals Yearbook 47-49; herein.)
B-227	Lodi	N½ sec. 18, T. 4 N., R. 14 E., M.D.M.	G. D. Martin, Sheep Ranch		Active 1860s and 1870s, when ore valued at $100 per ton was mined. Later became part of Sheep Ranch mine. See Sheep Ranch mine. (MSP 5/30/68: 352; 5/6/71:276.)
B-228	Lone Star (Reed and Hillary)	N½ sec. 5, T. 6 N., R. 13 E., and S½ sec. 32, T. 7 N., R. 13 E., M.D.M.	Paul J. Humphrey Estate, 841 Almont St., Yuba City		(MSP 8/25/66:118; 12/13/73: 372; 11/8/79:293; Brown 90: 152; Crawford 94:94; 96:111; Tucker 16:91-92; Hamilton 22: 27; Logan 23a:20; 23c:17; 24:76; herein.)
	Long Gulch	T. 2 N., R. 13 E., M.D.M., 2½ mi. S of Angels Camp	Not determined	On Mother Lode belt.	Some open cuts made prior to 1896. (Crawford 96:111.)
B-229	Longworth	Sec. 32, T. 3 N., R. 13 E., M.D.M.			

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-230	Lookout Mountain	SE¼ sec. 1 and NE¼ sec. 12, T. 4 N., R. 11 E., M.D.M.	Lookout Mountain Mining Co., 33 California St., San Francisco	.....	(Kerr 00; Logan 36:269-270; Julihn 38:126-127; herein.)
	Lopez.....	Secs. 33, 34, T. 4 N., R. 13 E., M.D.M., on ridge N of San Antonio Creek, near Esmeralda	Jesus Lopez, Esmeralda (1936)	Vein in mica schist strikes W and dips N.	Active prior to 1914. Developed by 180-ft. shaft. (Tucker 16:92; Logan 36:270.)
B-231	Lost Boy.....	NW¼ sec. 18, T. 4 N., R. 14 E., M.D.M., 1 mi. SW of Sheep Ranch	Mary E. Ronen et al., c/o W. W. Morse, 706 Capital National Bank Bldg., Sacramento (1936)	Vein in quartz-mica schist strikes NW.	Long idle. (Kerr 00.)
B-232	Lost Log.....	SW¼ sec. 20, T. 3 N., R. 11 E., M.D.M., 4 mi. due E of Jenny Lind	H. L. Donner, Milton..	Vein in slate strikes N.....	Long idle. Developed by shaft.
B-233	Lost Mexican....	Sec. 24, T. 7 N., R. 13 E., M.D.M.			
	Louisa.....	.....	.....	.....	See Falcon.
B-234	Louise.....	NE¼ sec. 12, T. 3 N., R. 14 E., M.D.M., in Collierville district 5 mi. E of Murphys on Camp 9 road	Not determined.....	Vein of white to gray quartz in micaceous slate and banded quartzite strikes W and dips N.	Long idle; prospected 1930s. Good-sized dump. Developed by W drift adit.
B-235	Lucas (La Fortuna)	SE¼ sec. 1, T. 5 N., R. 11 E., M.D.M., by Mokelumne River, 1 mi. N of Mokelumne Hill	Not determined.....	Two parallel veins in diorite strike N and dip W.	Active prior to and intermittently 1906-23. Developed by adit, drifts, and winze. (MSP 5/19/-06:333; Logan 23c:18, 143-144.)
B-236	Lucky.....	SE¼ sec. 11, T. 5 N., R. 12 E., M.D.M., 2 mi. NE of Jesus Maria	Willard Hughes, Mokelumne Hill	A 2- to 5-ft. quartz vein in mica schist with diorite dikes strikes N to N. 20° E. and dips steeply W. Ore yielded $8 to $10 per ton.	Operated 1929 to 1933 by owner. Developed by 150-ft. inclined shaft with level at 100 ft. with 500-ft. N and 50-ft. S drifts. Ore treated in 10-stamp mill.
	Lucky Boy.....	T. 6 N., R. 13 E., M.D.M., 2 mi. NW Railroad Flat	William Davis, Oakland (1936)	A 12- to 20-inch quartz vein strikes NE and dips SE.	Active 1934-35. Developed by 310-ft. crosscut adit, 200 ft. of drifts, and 38-ft. shaft. Ore treated in small mill. (Logan 36:270.)
B-237	Lucky Boy.....	SW¼ sec. 17, T. 3 N., R. 11 E., M.D.M., 4 mi. E of Jenny Lind by Whiskey Creek	Not determined.....	Vein in slate and greenstone strikes N.	Long idle.
B-238	Lucky Boy.....	W½ sec. 4, T. 3 N., R. 12 E., M.D.M., 4 mi. S of San Andreas	C. J. Tiscornia, San Andreas	On Mother Lode. Vein on schist-serpentine contact strikes N.	Intermittently prospected. Developed by 2 E-crosscut adits and drifts and 105-ft. inclined shaft. Little production. (Kerr 00; Tucker 16:92.)
	Lucky Find.....	Sec. 17, T. 4 N., R. 12 E., M.D.M., near San Andreas	Not determined.....	Vein zone as much as 100 ft. thick in slate strikes NW and dips NE.	Long idle. Worked through 100-ft. adit and 50-ft. shaft. (Kerr 00.)
	Lucky Jim and Gold Ridge	Sec. 18, T. 4 N., R. 13 E., M.D.M., 3 mi. SW Mountain Ranch	Maude E. Gerry, Mountain Ranch (1936)	Vein in slate and mica schist.	Prospected 1924 and 1934. Developed by shaft and adit (Logan 36:270-271.)
	Macchiavello....	Sec. 13, T. 4 N., R. 11 E., M.D.M., 2 mi. NW of San Andreas	Not determined.....	A 4-ft. vein in slate strikes NW and dips NE.	Long idle. Worked through 70-ft shaft and 70-ft. adit. (Kerr 00.
	Machu.....	.....	.....	.....	See Lindsey.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-239	Madison (Lane and Tulloch, Matson)	SE¼ sec. 33, T. 3 N., R. 13 E., M.D.M.	Utica Mines, Inc., 220 Montgomery St., San Francisco	.....	(MSP 3/2/82:293; 9/17/87: 184; Brown 90:151; Fairbanks 90:59-60; MSP 7/9/92:28; Preston 93:171; Crawford 94: 95; 96:111-112; Kerr 00; Ransome 00:9; Storms 00:111, 112; MSP 6/13/03:386; Logan 35:144; herein.)
	Mahala	Sec. 25, T. 6 N., R. 12 E., M.D.M., 2 mi. SW of Glencoe	Not determined	A 4-ft. vein in slate strikes NW and dips NE.	Active 1900. Developed by 250-ft. adit and 50-ft. shaft. (Kerr 00; MSP 12/22/00: 598.)
	Main Lode	Sec. 5, T. 5 N., R. 14 E., M.D.M., 4 mi. SE of Railroad Flat	R. H. Guilleman, Railroad Flat (1942)	.....	Active 1939-42. Ore treated in mill. (U. S. Bureau Mines records.)
3-240	Main and Fort Ritter	SW¼ sec. 27, T. 5 N., R. 13 E., M.D.M., on ridge N of Murray Creek, 4 mi. N of Mountain Ranch	Not determined	A 2½-ft. vein in slate strikes W.	Active prior to 1900. Developed by 115-ft. shaft and open cut. (Kerr 00; Tucker 16:92.)
3-241	Maloney	SW¼ sec. 13, T. 3 N., R. 12 E., M.D.M., 3 mi. NW of Angels Camp	Alice C. Cosgrave, Angels Camp	On Mother Lode. A 6-ft. vein with slate hanging wall and greenstone footwall strikes NW and dips NE.	Active 1896. Developed by open shaft. (Crawford 96:112; Kerr 00.)
	Maloney	Sec. 12, T. 5 N., R. 11 E., M.D.M., by Big B r ¾ mi. NW of Mokelumne Hill.	Not determined	A 5- to 12-ft. vein strikes N; diorite to E, granodiorite to W.	Active 1905 and around 1937. Developed by 80-ft. S and 60-ft. N shafts with connecting drift adit, and crosscut adits. (Tucker 16:92; Julihn 38:135.)
3-242	Maltman (Perlina)	S½ sec. 28, T. 3 N., R. 13 E., M.D.M., between Angels Camp and Altaville	Irene G. Lee and James H. Lee, 1745 Cayuga Ave., San Francisco	On Mother Lode. A 4- to 12-ft. vein with gouge in greenstone strikes NW and dips NE.	Active 1860s and 1897-1903. Developed by 200-ft. shaft. Ore treated in 4-stamp mill. (Crawford 96:112; MSP 1/16/-97:50; Storms 00:120; Logan 35:145.)
3-243	Maltos and Mexican	N½ sec. 30, T. 2 N., R. 12 E., M.D.M., adjoing Royal mine in Hodson district	Marie I. M. Allison and Juanita Rogers, 2295 Mallory St., San Bernardino	Quartz veins and auriferous greenstone strike NW and dip NE.	Gold produced from pockets prior to 1925 from vein which may be S extension of Mountain King vein. (Logan 25:155.)
3-244	Mammoth and Jumper	NW¼ sec. 5, T. 5 N., R. 12 E., M.D.M., 2 mi. NE Mokelumne Hill	Boston Mokelumne Mining Co., c/o Edward R. Solinsky, Hobart Bldg., San Francisco	Prospect containing series of N- and W-striking veins in granodiorite and slate.	Long idle. (Tucker 16:92)
3-245	Manhattan	Sec. 1, T. 3 N., R. 13 E., M.D.M.			
3-246	Marble Fay	Sec. 32, T. 3 N., R. 13 E., M.D.M.			
3-247	Marble Springs	.....	.....	.....	See Mother Lode Central.
3-248	Maria and Fortuna	W½ sec. 35, T. 4 N., R. 13 E., M.D.M., at Esmeralda by Indian Creek	Owen and Florence Foy et al., 415 Fillmore St., San Francisco	Three veins in mica schist strike NW and dip NE.	Consists of 4 claims. Active 1870s, 1894; worked around 1924 by Indian Creek Mining Co. Developed by 650- and 400-ft. adits and 154-ft. shaft. Ore treated in 8-stamp mill. (MSP 9/18/75:180; 1/20/94:45; Logan 25:155; 36:271.)
	Mariposa	.....	.....	.....	See Fazzi.
3-249	Mar John (Calaveras, Enchantress, Old Calaveras, Oro Minto)	W½ sec. 21, T. 4 N., R. 13 E., M.D.M.	Louis Domenghini and Lester Canevaro, Mountain Ranch	.....	(MSP 3/18/71:163; 12/13/84: 376; Crawford 94:91; 96:115; Kerr 00; Tucker 16:100; Logan 24:4; 25:157; 36:271-274; herein.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Markham	Sec. 22, T. 4 N., R. 13 E., M.D.M., 1 mi. NE of Fricot School	Not determined	A 6-ft. vein in slate and mica schist strikes W and dips N.	Long idle. Worked through 50-ft. shaft and 90-ft. adit. (Kerr 00.)
B-250	Marquis	Sec. 12, T. 6 N., R. 13 E., M.D.M.	James M. Marquis, West Point		Herein.
	Martha	Sec. 34, T. 5 N., R. 13 E., M.D.M., on Murray Creek, 1½ mi. NE Mountain Ranch	Chas. B. Coulter (1936), Mountain Ranch	3-ft. quartz vein strikes N. 30° W.	Intermittently active 1899-1910. Developed by 52-ft. shaft. (MSP 4/1/99:351; Tucker 16:92.)
	Mary Lowrey				See Shenandoah.
	Mascot				See Taylor.
	Matilda				See Alpha and Omega.
B-251	Matrimony	E½ sec. 2, T. 6 N., R. 13 E., M.D.M., at Bummerville 1 mi. E of West Point	C. A. Randlett, 2866 Santa Clara Ave., Alameda (1936)	Quartz vein in granodiorite with diorite dikes strikes N; sulfides abundant.	Extensively worked many years ago. Developed by shaft now caved.
	Matson				See Madison.
B-252	Matteson	W½ sec. 9, T. 4 N., R. 13 E., M.D.M., 1 mi. SE of Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N.	Long idle. Developed by shaft.
B-253	Max Gross	NE¼ sec. 36, T. 4 N., R. 13 E., M.D.M., 3 mi. NW of Murphys	Max Gross, 1040—18th St., Oakland (1936)	White to pink quartz vein with sulfides in mica schist strikes W and dips N.	Long idle. Developed by open inclined shaft.
	Maxwell	Sec. 32, T. 3 N., R. 13 E., M.D.M., 2 mi. W Angels Camp	Not determined	Vein in green schist strikes NW and dips NE.	Active prior to 1896. Developed by incline and crosscut adit. (Crawford 96:112.)
	May Day	Sec. 6, T. 3 N., R. 14 E., M.D.M., 1 mi. W of Murphys	L. Monte Verda, Angels Camp (1936)	Four parallel W-striking veins in mica schist dip N.	Active 1890s, 1914, and 1938-39. Developed by 2000-ft. crosscut adit and shafts. (Tucker 16:92.)
B-254	Mayflower	W½ sec. 23, T. 3 N., R. 10 E., M.D.M., 1 mi. E of Jenny Lind	Paul Sinclair et al., Jenny Lind (1936)	Vein in greenstone strikes N.	Long idle. Developed by shaft.
B-255	Mayflower (Banner)	W½ sec. 6, T. 3 N., R. 14 E., M.D.M., 1 mi. W of Murphys	Alexander Cuthill, Jr., Estate, et al., c/o G. K. Whitworth, 2200 Canyon Drive, Hollywood 28	Two parallel veins in mica schist and quartzite strike E, dip N.	Worked intermittently 1880s through 1936. Developed by 150-ft. E and 165-ft. W shafts. (MSP 5/27/82:340; Crawford 94:95; 96:112; Kerr 00; Tucker 16:93.)
	McCarty				See Ranch.
	McCormick				See Angels.
	McCreight				See Hardy. (Kerr 00.)
	McGary				See Chapman.
	McKinley	Sec. 10, T. 2 N., R. 13 E., M.D.M., 2 mi. S of Angels Camp	Not determined	Vein in green schist strikes NW and dips NE.	Active prior to 1896. (Crawford 96:112.)
	McKisson				See Etna.
	McNair				See Washington.
	McQuig				See Dodson.
	Mead	Sec. 35, T. 6 N., R. 12 E., M.D.M.; in Rich Gulch area	Not determined	Series of narrow veins in slate strike NE and dip SE.	Long idle. Worked through 40-ft. shaft and 380-ft. adit. (Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
-256	Melones		Fred G. Stevenot, 300 Montgomery St., San Francisco		See Carson Hill. (Crawford 94:95; 96:112-13; Kerr 00; Ransome 00:9; Storms 00:120-21; Tucker 16:93-96; Hamilton 20:15-17; Logan 21:422; 23b:98; 24:5; 25:147; Knopf 29:72-77; Logan 35:133-35; 36:247-48; Burgess 37:1-15; Julihn 38:100-110; Bowen 48:55.)
	Mentzel Hill	Sec. 11, T. 6 N., R. 13 E., M.D.M., near West Point	Not determined	Several narrow veins in granodiorite with abundant sulfides strike NW and dip NE.	Long idle. Worked through 80-ft. shaft and 50-ft. adit. (Kerr 00.)
	Meridian	Sec. 11, T. 5 N., R. 13 E., M.D.M., 3 mi. S of Railroad Flat	Not determined	Two 6-ft. veins in slate strike NW and dip NE.	Long idle. Worked through 50-ft. shaft and open cut. (Kerr 00.)
	Merrimac				See Allison-Merrimac.
	Mervy	T. 2 N., R. 13 E., M.D.M., 6 mi. NE of Copperopolis	L. Mervy, Copperopolis (1936)	A NW-striking vein, in slate.	Prospected prior to 1936. Developed by adit. (Logan 36: 275.)
-257	Mester	NE¼ sec. 14, T. 4 N., R. 11 E., M.D.M., 2 mi. W of San Andreas by Highway 12	Charlotte L. Dragomanovich, San Andreas	A 4-ft. vein in slate strikes NW, dips NE.	Active prior to 1900. Developed by 90-ft. shaft and 125-ft. adit. (Kerr 00; Tucker 16:960)
	Meteor	T. 4 N., R. 13 E., M.D.M., 8 mi. E of San Andreas	Not determined	A 1-ft. vein in slate and mica schist.	Prospected around 1896; developed by shaft and drift adit. Ore treated in 2-stamp mill. (Crawford 96:113.)
-258	Mexican	Sec. 24, T. 2 N., R. 13 E., M.D.M.			
-259	Mexican	W½ sec. 20, T. 6 N., R. 13 E., M.D.M., ½ mi. NE of Glencoe	Haslett Warehouse Co., 680 Beach St., San Francisco 9	Vein in quartz-mica schist and slate strikes N.	Prospected 1930s. Developed by shaft. See also Glencoe group.
	Mexican	On Bummerville Ridge, 1½ mi. SE of West Point	Not determined	Vein in granodiorite strikes N.	Active 1880s, 1914, early 1930s, 1941; operated 1947-49 by E. B. Miles of Oakland. Developed by shaft. (MSP 7/16/-81:36; Kerr 00; Tucker 16:96.)
	Mexican				See Carson Hill.
	M. G.	Sec. 23, T. 2 N., R. 13 E., M.D.M., on Mother Lode near Carson Hill	Not determined	Vein up to 28 ft. thick in greenstone strikes N and dips 78° E.	Active early 1900s. Worked through 900-ft. adit and 60-ft. shaft. (Kerr 00.)
-260	Michel	NW¼ sec. 10, T. 5 N., R. 13 E., M.D.M., on ridge S of Nelson Gulch, 3 mi. SW of Railroad Flat	John H. Tone, et al., Rt. 3, Box 325, Stockton	An 8-ft. vein in quartz-mica schist strikes NW and dips NE.	Active prior to 1914. Developed by 600-ft. drift adit and 100-ft. shaft. Ore treated in 10-stamp mill. (Kerr 00; Tucker 16:97.)
	Midland	Sec. 30, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Altaville	Not determined	Vein in greenstone strikes NW and dips NE.	Long idle. Worked through 105-ft. shaft and 390-ft. adit. Ore treated in 5-stamp mill. (Kerr 00.)
-261	Midnight	S½ sec. 17, T. 3 N., R. 11 E., M.D.M., 5 mi. E of Jenny Lind, by Whiskey Creek	Wm. Mobley, R.F.D. Box 1320, Stockton (1936)	Vein in greenstone strikes N.	Long idle.
	Midwinter	Sec. 8, T. 2 N., R. 12 E., M.D.M., 5 mi. N of Copperopolis	Not determined	A 50-ft. vein zone with diorite hanging wall and slate footwall strikes NW and dips SW.	Long idle. Worked through 30-ft. shaft and open cut. (Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Mikado	Sec. 35?, T. 6 N., R. 13 E., M.D.M., at Railroad Flat	M. E. Taylor, Railroad Flat (1936)	A 3-ft. vein with abundant sulfides strikes N and dips E; slate and mica schist country rock.	Active prior to and in 1936. Developed by 130-ft. inclined shaft. (Logan 36:275.)
	Mina Rica	Sec. 7, T. 6 N., R. 14 E., and sec. 12, T. 6 N., R. 13 E., M.D.M., 3 mi. SE of West Point Point adjoining Lockwood mine	Lockwood Cons. Gold Mining Co., 1834 Sutter St., San Francisco	Vein in granodiorite strikes N; abundant sulfides.	Extensively worked in 1860s and 1870s; ore treated in 10-stamp mill. Developed by 3 shafts, deepest being 240 ft. See also Lockwood. (MSP 4/16/65: 227; 9/18/75:180; Tucker 16:96.)
	Mineral Mountain				See Carson Hill.
B-262	Minnesota	Sec. 24, T. 7 N., R. 13 E., M.D.M.			
	Minnie	Sec. 19, T. 6 N., R. 13 E., M.D.M., on ridge N of Mosquito Gulch, ½ mi. N of Glencoe	Not determined	Vein in mica schist strikes N.	Active prior to 1914. Ore treated in 4-stamp mill. (Tucker 16: 96.)
	Minnie	Sec. 29, T. 4 N., R. 12 E., M.D.M., 2 miles SW of San Andreas	Not determined	A 6-ft. vein with greenstone hanging wall and slate footwall strikes NW and dips NE.	Long idle. Worked through shallow shaft. (Kerr 00.)
	Minnie Hennesay				See Angels.
B-263	Miralda				See Buckhorn Cons.
B-264	Missouri	Sec. 11, T. 2 N., R. 13 E., M.D.M.			
	Mitchell	T. 1 N., R. 13 E., M.D.M., 5 mi. S of Copperopolis	Mills Mitchell, Vallecito (1936)	Two parallel 1- to 3-ft. quartz veins in slate strike NE and dip SE.	Active prior to and around 1936. Developed by 35- and 80-ft. shafts. (Logan 36:275.)
	M.J.B.	T. 5 N., R. 13 E., M.D.M., 4 mi. S of Railroad Flat	C. Burns, Railroad Flat (1936)	A 1- to 2-ft. vein in mica schist strikes E.	Active prior to and in 1936. Developed by 120-ft. shaft. Ore treated in 3-stamp mill. (Logan 36:275.)
	Modoc	Secs. 25 and 36, T. 7 N., R. 13 E., M.D.M., NE of West Point	Dominion Mining Organization, Merchant's Exchange Building, San Francisco (1936)	Vein in granodiorite strikes N.	Active 1870s; prospected by Dominion Mining Organization, Inc., 1922-25. (MSP 8/15/74: 100; Logan 25:151-52.)
B-265	Mohawk (Keystone)	NE¼ sec. 35, T. 6 N., R. 13 E., M.D.M., ¼ mi. S of Railroad Flat	Delbert Seeman, Railroad Flat	A 1-ft. quartz vein in slate and mica schist strikes N. 30° E. and dips 45° SE.	Active 1908 and 1914; worked intermittently since 1952. Developed by 260-ft. inclined shaft with levels at 50, 100, and 200 ft. Ore treated in trommel and sluice. (MSP 7/18/08:71; Tucker 16:97.)
B-266	Mohawk	NE¼ sec. 31, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Angels Camp	C. Champion, Altaville	On Mother Lode. A 3-ft. vein with gouge in phyllite and green schist strikes N. 45° W. and dips NE; some high-grade pockets.	Active many years ago, 1924, and 1934; now prospected intermittently. Has output of more than $8000. Developed by open 200-ft. inclined shaft with levels at 100 and 200 ft., two E crosscut adits and open cuts. Ore treated in 2-stamp mill. (Logan 25:156; 35:145; 36:275.)
B-267	Mohican	Sec. 32, T. 7 N., R. 13 E., M.D.M.			
B-268	Monmouth	Sec. 32, T. 7 N., R. 13 E., M.D.M.			

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
3-269	Montana.... ...	S½ sec. 25, T. 5 N., R. 12 E., M.D.M., on ridge N of Salamander Gulch, 6 mi. NE of San Andreas	M. Gattavaro, Mountain Ranch (1936)	A 2-ft. quartz vein in mica schist strikes N and dips 55° E.	Active 1870s, 1880s, and 1910-14. Developed by 2 drift adits and open cuts. Ore treated in 2-stamp mill. (MSP 7/28/78: 196; 2/12/10:270; Tucker 16: 97.)
	Monte Carlo....	Sec. 5, T. 5 N., R. 12 E., M.D.M., 2 miles NE of Mokelumne Hill	Not determined.....	A 4-ft. vein in slate strikes NE and dips SE.	Active early 1900s. Worked through 80-ft. shaft and 170-ft. adit. (Kerr 00.)
	Monte Christo...	T. 7 N., R. 14 E., M.D.M., 6 mi. NW of West Point near Mokelumne River	J. S. Wright, 1608 Derby St., Berkeley (1936)	Series of N-striking veins in granodiorite.	Active prior to 1914. Developed by drift adits. (Tucker 16:97.)
3-270	Morgan.....	.....	Fred G. Stevenot, 300 Montgomery St., San Francisco	.....	See Carson Hill. (Fairbanks 90: 57; Irelan 90:37; Crawford 94: 95; 96:113; Kerr 00; Tucker 16:97; Logan 21:423-24; Hamilton 22:27; Logan 25: 147-50; Knopf 29:72-77; Logan 35:129-133; 36:247-48; Burgess 37:1-15; Julihn 38: 100-110; Bowen 48:55.)
	Morning Star (Dublin, Kuhn)	SE¼ sec. 19, T. 2 N., R. 12 E., M.D.M., 4 mi. NW of Copperopolis	C. Monte Verda et al., Altaville	Quartz veins in greenstone strike NW and dip NE.	Active 1890s and 1935-36 when about 2000 tons of $5.35 ore mined. Developed by open pit and 90-ft. inclined shaft. (Crawford 96:102; Kerr 00; Logan 36:275-276.)
3-271	Morning Star....	SW¼ sec. 20, T. 3 N., R. 11 E., M.D.M., 8 mi. NE of Milton	Ed Sieffert, Angels Camp (1936)	A faulted quartz vein in greenstone with dikes.	Mined in 1890s. Developed by crosscut adit. (Crawford 96: 113.)
3-272	Morning Star....	W½ sec. 11, T. 5 N., R. 13 E., M.D.M., 3 mi. S of Railroad Flat	M. H. McGary, Mokelumne Hill (1936)	Vein in quartz-mica schist strikes N.	Long idle. Developed by shaft.
	Morris.....	Sec. 11, T. 2 N., R. 13 E., M.D.M., on Mother Lode 2 mi. SE of Angels Camp	Not determined.....	Vein zone as much as 30 ft. thick with diorite hanging wall and slate footwall strikes NW and dips NE.	Long idle. Worked through 120-ft. shaft. (Kerr 00.)
	Moser (Roanoke)	S½ sec. 18, T. 5 N., R. 12 E., M.D.M., on Chili Gulch, 2 mi. S of Mokelumne Hill	Roanoke Mining Co., c/o Frank A. West, 311 E. Main St., Stockton	A 5-ft. vein exposed in bedrock tunnel of Moser hydraulic mine.	Operated after 1896 by Roanoke Mining Co. Developed by shaft and drifts on 3 levels. See also Moser hydraulic mine. (MSP 2/4/93:77; Kerr 00; 00; Tucker 16:98; Logan 36: 267.)
3-273	Mother Lode Central (Bullion, Marble Springs)	SE¼ sec. 3 and NE¼ sec. 10, T. 2 N., R. 13 E., M.D.M.	Aileen A. Morgaus et al., and Tillie Rolleri et al., c/o Romie Rolleri, Angels Camp	.....	(Kerr 00; Tucker 16:72; Logan 36:276-277; Julihn 38:116-117; Minerals Yearbook 39: herein.)
3-274	Mountain King ..	SW¼ sec. 19 and NW¼ sec. 30, T. 2 N., R. 12 E., M.D.M.	C. W. Stewart and C. E. Nuss, P.O. Box 886, Fresno	.....	(Crawford 96:114; Kerr 00; MSP 11/12/04:330; Logan 25:155-156; 36:277; Minerals Yearbooks 37, 38; Julihn 38:119; Minerals Yearbooks 39-47; herein.)
3-275	Mount Nebo....	SW¼ sec. 30, T. 3 N., R. 14 E., M.D.M., ½ mi. W of Vallecito	Mrs. C. J. Hambleton Estate, c/o John T. Martin, Route 1, Box 117, Earlimart, Tulare Co.	Vein with slate footwall and granite hanging wall strikes E and dips 80° S.	Active 1896. Developed by 70-ft. shaft. (Crawford 96:114; Tucker 16:98.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Mount Timolus	Sec. 36, T. 5 N., R. 12 E., M.D.M., on ridge SW of Salamander Gulch, 5 mi. NE of San Andreas	J. S. Jack, Mountain Ranch, (1936)	A 2-ft. vein strikes NE and dips SE.	Active 1870s, 1887, and 1914. Developed by 300-ft. shaft. Ore treated in 10-stamp mill. (MSP 10/9/75:309; 8/6/87: 88; Tucker 16:98.)
	Mountain View	Sec. 30, T. 6 N., R. 13 E., M.D.M., 1 mi. S of Glencoe	Not determined.....	A 4-ft. vein in slate strikes N. 30° W. and dips 65° NE.	Active 1902. Developed by shaft. (MSP 3/29/02:180; Tucker 16:98.)
	Murphy Divide	Sec. 5, T. 3 N., R. 14 E., M.D.M., ½ mi. E of Murphys	Frank Grenitta, Douglas Flat (1936)	A quartz vein with abundant galena and silver in limestone strikes NW and dips NE; ore reported to contain abundant silver and lead.	Active 1918 and 1934-36. Developed by 150-ft. shaft with levels at 50, 100, and 150 ft. and 100-ft. shaft. (Logan 36: 277-278.)
B-276	Murry Creek (El Dorado)	SE¼ sec. 33, T. 5 N., R. 13 E., M.D.M., 1 mi. N of Mountain Ranch	Murry Creek Mining Co., c/o Albert Wanner, 6251 Contra Costa Rd., Oakland	Vein in quartz-mica schist strikes N.	Active prior to 1896. (Crawford 96:114.)
B-277	Nancy Ann (Donner)	NE¼ sec. 6, T. 2 N., R. 11 E., M.D.M., 4 mi. NE of Milton, in South Gulch	E. L. Hunt, Farmington	A pyritic silicified zone in greenstone up to 30 ft. thick stikes N. 15° W. and dips 60° W. Some $6 ore recovered.	Operated 1934-38 by H. L. Donner. Developed by two open 40-ft. inclined shafts, W-crosscut adit, and open cut. Ore trammed ¼ mile to 10-stamp mill with tables. (Logan 36: 278.)
	Napoleon and Louisa Con.	Sec. 2, T. 4 N., R. 11 E., M.D.M., 4 mi. NW of San Andreas	Not determined.....	A 6-ft. vein in greenstone strikes NW and dips NE.	Long idle. Worked through 50-ft. shaft and 140-ft. adit. Ore treated in 3-stamp mill. (Kerr 00.)
B-278	Nellie	Sec. 3, T. 2 N., R. 13 E., M.D.M.			
	Nelson	Sec. 14, T. 6 N., R. 13 E., M.D.M., 2 mi. S of West Point	Not determined.....	Vein in granodiorite strikes E and dips S.	Unpatented claim. Active around 1914. Developed by several shafts. (Tucker 16:98.)
	Neversweat	Sec. 2, T. 6 N., R. 13 E., M.D.M., 1 mi. E of West Point	Not determined.....	Vein in granodiorite strikes N; abundant sulfides.	Operated 1948 by L. V. Starrs of West Point. Ore treated in 3-stamp mill. (U. S. Bureau Mines records.)
	Never Sweat	Sec. 13, T. 4 N., R. 11 E., M.D.M., 2 mi. W of San Andreas	Rosalie M. Brown, 2 S. Delaware St., San Mateo (1936)	A 10-ft. vein with greenstone hanging wall and slate footwalls strikes NW and dips NE.	Long idle. Worked through 75-ft. shaft. (Kerr 00.)
	New Champion	.....	.....	.....	See Centennial.
	New Discovery	Sec. 7, T. 4 N., R. 13 E., M.D.M., 6 mi. E of San Andreas	Not determined.....	Two veins as much as 10 ft. thick strike NW and dip NE.	Long idle. Worked through 45-ft. shaft and 35-ft. adit. (Kerr 00.)
B-279	New Ford	SE¼ sec. 26 and NE¼ sec. 35, T. 4 N., R. 13 E., M.D.M., 3 mi. NW Murphys by Indian Creek	Thomas Ehrhart, Murphys	A vein in mica schist strikes W and dips N; gold is in small pockets; associated with diorite dike.	Recently active. Developed by 100-ft. inclined shaft.
	New Year	.....	.....	.....	See Carson Hill.
	New York	Sec. 31, T. 6 N., R. 13 E., M.D.M., on New York Hill, 1½ mi. E of Railroad Flat	Not determined.....	Vein in black slate strikes N, dips E.	Unpatented claim. Active 1860s, 1880s, and 1890s. Developed by 140-ft. shaft. (MSP 3/24/66:179; 4/20/89:276; Crawford 94:96; 96:114; Tucker 16:98.)
	New York-Calaveras	.....	.....	.....	See Ranch.
	Nixon	Sec. 2, T. 6 N., R. 13 E., M.D.M., 1 mi. NE of West Point	Not determined.....	Vein in granodiorite strikes N; abundant sulfides.	Prospected 1890s. Developed by shaft. (Crawford 96:114; Tucker 16:98.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
3-280	Norma	SE¼ sec. 3, T. 3 N., R. 12 E., M.D.M., 3 mi. SE of San Andreas by Highway 49	John Guttinger, San Andreas	Vein zone up to 50 ft. thick in slate and schist strikes NW and dips NE. On Mother Lode.	Long idle. Worked through 50-ft. shaft. (Kerr 00.)
	Norrie				See Afterthought.
3-281	North Branch	SW¼ sec. 13, T. 4 N., R. 11 E., M.D.M., 2 mi. W of San Andreas	Not determined	A 2-ft. vein in slate and greenstone strikes NW and dips NE.	Long idle. Worked through shallow shaft and 50-ft. adit. (Kerr 00.)
	North End				See Etna King.
	North Star	Sec. 23, T. 5 N., R. 13 E., M.D.M., 3 mi. NE of Mountain Ranch	Not determined	A 9-ft. vein strikes N and dips E.	Long idle. Worked through 45-ft. shaft and 35-ft. adit. (Kerr 00.)
	North Star	Secs. 1 and 12, T. 6 N., R. 13 E., M.D.M., on ridge E of Bear Creek 2 mi. E of West Point	Not determined	Vein in granodiorite strikes N; abundant sulfides.	Active prior to 1896. Developed by shaft. (Crawford 96:115; Tucker 16:99.)
3-282	North Star (Zacatera)	NE¼ sec. 35, T. 7 N., R. 13 E., M.D.M., at Skull Flat 2½ mi. NE of West Point	Martin J. Fischer Estate, West Point	Vein in granodiorite strikes N; abundant sulfides.	Extensively worked 1860s-70s; prospected early 1920s. Developed by 400-ft. crosscut adit connected to 340-ft. shaft. Ore treated in 5-stamp mill. (MSP 12/1/66:342; 12/23/76:413; Crawford 96:123; Tucker 16:99; Logan 25:151-152.)
3-283	North Star	S½ sec. 33, T. 3 N., R. 13 E., M.D.M., at Angels Camp	Utica Mines, Inc., 220 Montgomery St., San Francisco	A 15-ft. zone of mineralized amphibolite schist with abundant sulfides strikes W and dips N. On Mother Lode.	Active 1880s and 1909 to 1913. Developed by 480-ft. inclined shaft with levels at each 100 ft. Ore treated in 40-stamp mill. (MSP 3/26/87:208; 11/12/-10:652; Tucker 16:98-99; Logan 35:145.)
	North Star				See Banner.
	Norwich				See Nucleus.
	Novella				See Chino.
3-284	Nucleus (Norwich)	N½ sec. 30, T. 6 N., R. 13 E., M.D.M., ½ mi. SW of Glencoe	Mrs. Celia Frank Estate, c/o Edward R. Solinsky, Hobart Bldg., San Francisco	A 1- to 12-ft. quartz vein in mica schist strikes NE and dips SE.	Active 1880s and 1935-39. Developed by 200-ft. inclined shaft with levels at 125 and 200 ft. (MSP 11/20/80:324; Kerr 00; Tucker 16:99; Logan 36:278.)
3-285	Oakum	Sec. 26, T. 7 N., R. 13 E., M.D.M.			
	Occidental	Sec. 22, T. 5 N., R. 11 E., M.D.M., 1 mile NE of Paloma	Not determined	An 8-ft. vein in slate strikes NW and dips NE.	Active early 1900s. Worked through 50-ft. shaft and open cut. (Kerr 00.)
	O'Hara	Sec. 33, T. 5 N., R. 13 E., M.D.M., 1 mile N of Mountain Ranch	Not determined	A 2½-ft. vein in slate strikes W and dips S.	Long idle. Worked through 100-ft. shaft. (Kerr 00.)
	Ohio	Sec. 11, T. 5 N., R. 12 E., M.D.M., .2 mi. NE of Jesus Maria	Not determined	A 4- to 20-ft. vein on slate-granite contact strikes NW and dips NE.	Long idle. Worked through 345-ft. shaft and 300-ft. adit. (Kerr 00.)
	Ohio	Sec. 25, T. 3 N., R. 13 E., M.D.M., on Indian Creek 3½ mi. N of Murphys	Jack Klare, 238 Castle St., Modesto (1936)	Vein in quartz-mica schist strikes NW and dips NE.	Unpatented claim. Active prior to 1914; prospected 1930s. Developed by 2 adits and 300-ft. shaft. (Tucker 16:99; Logan 36:278.)
	O.K.				See Buckhorn Cons.
	Old Calaveras				See Mar John.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-286	Old Dan Reynolds	Sec. 23, T. 6 N., R. 13 E., M.D.M.			
B-287	Old Gray.....	Sec. 26, T. 7 N., R. 13 E., M.D.M.			
B-288	Old Henry.....	SW¼ sec. 35 and SE¼ sec. 34, T. 7 N., R. 13 E., M.D.M., on ridge between Mott's and Skull Flat Gulches 1 mi. NE of West Point	Mary Rowe Estate, et al., c/o James Rowe, 203 Pleasant St., Grass Valley	A 1- to 3-ft. vein in granodiorite strikes NW and dips SW; abundant sulfides.	Active 1890s. Developed by 167-ft. shaft. Ore treated in 10-stamp mill. (Crawford 94:92; 96:103; Kerr 00; Tucker 16:78.)
B-289	Old McKinney..	SE¼ sec. 10 and SW¼ sec. 11, M.D.M., by McKinney Creek, 5 mi. SE of Mountain Ranch	Clorinda Domenghini, Mountain Ranch	Vein in graphitic schist and slate.	Active prior to 1900. Developed by adit. (Kerr 00.)
	Old Washington.	Sec. 34, T. 4 N., R. 14 E., M.D.M., on San Antonio Creek, 6 mi. NE of Murphys	Not determined.....	Two veins in siliceous slate strike W and dip N.	Unpatented claim. Active prior to 1914. Developed by 100-ft. shaft. (Tucker 16:99.)
	Omega.....	.....	.....	.....	See Alpha and Omega.
	Oneida.....	.....	.....	.....	See Angels.
B-290	Oneto.....	W½ sec. 15, T. 5 N., R. 11 E., M.D.M., 3 mi. SW of San Andreas by Mokelumne River	Not determined.....	Vein in slate strikes N and dips E. On Mother Lode.	Long idle. (Kerr 00.)
	Ophir Cons.....	Sec. 35, T. 6 N., R. 12 E., M.D.M., in Rich Gulch, 5 mi. NE of Mokelumne Hill	Not determined.....	A 4-ft. vein with diorite hanging wall and slate footwall strikes W and dips 70° N.	Active prior to and in 1910. Developed by 170-ft. adit now caved. (Kerr 00; MSP 6/25/10:943.)
	Ophir Mountain Cons.	Sec. 35, T. 4 N., R. 12 E., M.D.M., 5 mi. NW of San Andreas	Frank Bernardini, 2226 N. California St., Stockton (1936)	Vein strikes NW and dips NE.	Long idle.
B-291	Oriental.....	NE¼ sec. 11, T. 6 N., R. 13 E., M.D.M., 2 mi. SE of West Point	Not determined.....	Vein with abundant sulfides in granodiorite strikes N and dips E.	Long idle. Worked through 105-ft. shaft and 135-ft. drift. (Kerr 00.)
B-292	Oriole Consolidated (Big Bonanza, Harris, Nemo)	SW¼ sec. 3, T. 2 N., R. 13 E., M.D.M., just S of Angels Camp and W of Hwy. 49	A. L. Lavagnino, Angels Camp	On Mother Lode. A 10- to 50-ft. vein of quartz in greenstone strikes N and dips E.	Active early days when surface yielded $30,000; and 1897 to 1905. Developed by 900-ft. vertical shaft with levels at 100-ft. intervals to 600 ft. Ore treated in 10-stamp mill. (MSP 10/28/97:390; 5/23/03:339; Storms 00:121; Tucker 16:99-100; Logan 35:145-146.)
	Oro Fino.....	.....	.....	.....	See Pilot.
	Oro Minto.....	.....	.....	.....	See Mar John.
B-293	Oro y Plata (Red Wing, Willard)	NE¼ sec. 6, T. 3 N., R. 14 E., M.D.M.	Mary Bess Norton, c/o J. C. Scoles, Murphys	.....	(MSP 4/13/67:230; 1/3/85:8; Morse 87:35-42; Crawford 94:96, 99; 96:115; Kerr 00; Tucker 16:100; Logan 36:278-281; Julihn 38:124-126; herein.)
B-294	Osborne (Belmont-Osborne)	SE¼ sec. 30, T. 3 N., R. 13 E., M.D.M.	George W. Osborne, et al., Ripon	.....	(MSP 11/20/80:324; Kerr 00; Logan 35:146; 36:241-42; herein.)
B-295	Our Flag.....	N½ sec. 19, T. 2 N., R. 14 E., M.D.M., 1 mi. E of Melones	B. & W. McArdle, et al., 1406 N. Van Buren, Stockton 3	Several narrow veins in mica schist strike N and dip E; some small rich pockets.	Pockets worked around 1896; prospected early 1930s. Developed by N drift adit. (Crawford 96:115; Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
3-296	Owl	Sec. 24, T. 7 N., R. 13 E., M.D.M.			
	Pamona				See Alexander.
	Pandora	Sec. 10, T. 4 N., R. 12 E., M.D.M., 2 mi. NE of San Andreas	Not determined	Two 6-ft. veins in slate strike NW and dip NE.	Long idle. Worked in open cut. (Kerr 00.)
3-297	Panuga	Sec. 30, T. 3 N., R. 13 E., M.D.M.			
	Paragon	S½ sec. 13, T. 6 N., R. 13 E., M.D.M., on ridge S of Licking Fork of Mokelumne River, 3 mi. SE of West Point	Not determined	Series of parallel veins in slate strike NW and dip SW.	Active 1890s, 1900, and 1914. Developed by several adits and 80-ft. shaft. Had a mill. (MSP 5/8/97:390; Kerr 00; Tucker 16:100.)
3-298	Painell	Sec. 30, T. 3 N., R. 13 E., M.D.M.			
	Particelli	T. 5 N., R. 11 E., M.D.M., 3 mi. W of Mokelumne Hill	Not determined	A 4-ft. vein in greenstone.	Prospected in 1890s. Developed by adit. (MSP 8/12/93:109; Crawford 94:96; 96:116.)
	Pat				See Angels Deep.
3-299	Patsy Bob (Rio Vista)	NW¼ sec. 25 and NE¼ sec. 26, T. 2 N., R. 13 E., M.D.M., 1½ mi. SW of Melones	Rio Vista Mining Co., c/o A. D. Cuchow, 1659—40th Ave., San Francisco 22	A 240-ft.-wide mineralized zone in schist and slate with sulfides and tellurides.	Active prior to 1900 and 1931-37. Developed by open cuts, adit, and shafts. Ore treated in 2-stamp mill. (Kerr 00; Logan 36:281-282; Julihn 38:129-130.)
	Pawtucket	Sec. 20, T. 3 N., R. 12 E., M.D.M., 4 mi. SW of Fourth Crossing	Not determined	Two 5-ft. veins in slate and schist strike NW and dip NE.	Long idle. Worked through 30-ft. shaft. (Kerr 00.)
3-300	Pay Day	Sec. 26, T. 6 N., R. 13 E., M.D.M.			
3-301	Pay Rock	Sec. 6, T. 3 N., R. 14 E., M.D.M.			
3-302	Pedro	NE¼ sec. 4, T. 3 N., R. 12 E., M.D.M.	John Guttinger, San Andreas		See Union-Rathgeb group. (Kerr 00; Logan 36:292.)
	Pearline	S½ sec. 30, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Altaville	L. K. Austin and Robert Hall, Altaville (1936)	On Mother Lode. Three narrow veins striking NW and dipping NE.	Prospected in 1930s. Developed by 25- and 50-ft. vertical shafts. (Logan 36:282.)
3-303	Peek Ranch	SW¼ sec. 5 and SE¼ sec. 6, T. 5 N., R. 12 E., M.D.M., 2 mi. NE of Mokelumne Hill	Percy Peek et al., Mokelumne Hill	Series of N- and E-striking veins in slate and granodiorite.	Active prior to 1914. (Tucker 16:100.)
	Peirano (Santa Ana)	NE¼ sec. 14, T. 2 N., R. 13 E., M.D.M., 2 mi. S of Angels Camp	Louisa Peirano Estate, 1808 Pacific Ave., San Francisco	On Mother Lode. Vein in green schist strikes NW and dips NE.	Active in 1890s. (Kerr 00; Crawford 96:115, 119.)
	Penny	Sec. 23, T. 3 N., R. 10 E., M.D.M., 1 mi. E of Jenny Lind	Not determined	Vein in greenstone strikes N.	Long idle. Developed by shaft.
	Perlina				See Maltman.
3-304	Petticoat	E½ sec. 26, T. 6 N., R. 13 E., M.D.M.	Thomas A. Taylor, Railroad Flat		(MSP 12/7/67:258; 1/30/69:70; 3/8/73:149; 11/4/96:406; Crawford 96:115; Kerr 00; Tucker 16:100; herein.)
	Pierano				See Peirano.
	Pierce				See Deer Lodge.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-305	Piety Hill	E½ sec. 8, T. 3 N., R. 14 E., M.D.M., 1 mi. SE of Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N.	Long idle. (Kerr 00.)
B-306	Pilot (Oro Fino)	SW¼ sec. 4, T. 4 N., R. 13 E., M.D.M., on ridge between O'Neils and McKinneys Creeks, 5 mi. NW of Murphys	Not determined	Vein in quartz-mica schist strikes NW.	Active 1860s, 1885-1900. Developed by 180-ft. shaft. Ore treated in 4-stamp mill. (MSP 12/19/85:402; 2/23/95:115; Tucker 16:100-01.)
	Pine Cone	Sec. 34, T. 5 N., R. 13 E., M.D.M., 2 mi. NE of Mountain Ranch	C. I. Eaton, R.F.D. 1, Box 407, Stockton (1936)	Vein in mica schist strikes N.	Long idle.
	Pine Log				See Royal.
	Pine Nut				See Black Oak.
	Pine Peak	Sec. 36, T. 5 N., R. 11 E., M.D.M., 5 mi. S of Mokelumne Hill	Not determined	A 10-ft. vein with slate hanging wall and greenstone footwall strikes NW.	Long idle. Worked through shallow shaft and open cut. (Kerr 00.)
	Pioche		G. D. Martin, Sheep Ranch		See Sheep Ranch. (MSP 3/10/77:149; 10/30/86:284; Kerr 00.)
	Pioneer	Sec. 30, T. 4 N., R. 12 E., M.D.M., 2 mi. SW of San Andreas	Not determined	A 4-ft. vein in slate strikes NW and dips NE.	Long idle. Worked through 150-ft. shaft and open cut. (Kerr 00.)
B-307	Pioneer	NE¼ sec. 11, T. 1 N., R. 11 E., M.D.M., 2 mi. NE of Telegraph City	Dorothy A. Castle, Copperopolis	A 3-ft. quartz vein in pyritic kaolinized greenstone strikes N and dips E; ore contained $6 per ton in gold.	Gold and copper mine. Intermittently operated 1933 to 1940 by G. C. Copp of Copperopolis. Developed by open 160-ft. W crosscut adit and 2 shallow shafts. (Logan 36:282.)
	Pioneer				See Angels Deep. (MSP 4/17/69:246; Kerr 00.)
B-308	Pioneer Chief (Thorn)	W½ sec. 29, T. 4 N., R. 12 E., M.D.M., 2 mi. S of San Andreas and ½ mi. W of Kentucky House	Francis M. Young, c/o Crocker First National Bank, 1 Montgomery St., San Francisco, and Calaveras Cement Co., 315 Montgomery St., San Francisco	A 5-ft. vein with much gouge strikes NW and dips NE; slate hanging wall, greenstone footwall. On Mother Lode.	Active 1860s to about 1889 and intermittently 1916 to 1931. Developed by two shafts, one 535 ft. deep on incline. (MSP 2/22/68:118; 2/24/72:116; Fairbanks 90:63; Crawford 96:115; Kerr 00; MSP 1/22/16:141; Tucker 16:101; Logan 35:146.)
B-309	Plymouth Rock	SW¼ sec. 23, T. 3 N., R. 10 E., M.D.M., 1 mi. E of Jenny Lind	W. E. Chance et al., c/o Higgins and Sons, 1800 Market St., San Francisco 2	Mineralized zone in altered metadiabase strikes NW and dips SW.	Active 1860s, and intermittently 1888 to 1917. Developed by open pit, 362-ft. drift adit, and 135-ft. inclined shaft. Ore treated in 10-stamp mill. (MSP 6/22/67:390; 2/1/96:90; Irelan 88:147-148; Crawford 96:115-116; Kerr 00; Tucker 16:101; Eric 48:222.)
B-310	Poe (Dan Reynolds)	SW¼ sec. 26, T. 6 N., R. 13 E., M.D.M., just W of Railroad Flat	Thomas A. Taylor, Railroad Flat	A 2-ft. vein strikes N and dips E; an undeveloped 5-ft. vein.	Active 1870s; prospected 1934. Developed by 90-ft. shaft. (MSP 7/9/70:28; Kerr 00; Logan 36:282.)
	Point Rock				See Carson Hill.
B-311	Poor Man (Rand)	NE¼ sec. 21, T. 6 N., R. 13 E., M.D.M., on ridge S of Mokelumne River, 2 mi. E of Glencoe	California Rand Mining Co., c/o George C. List, 427 West York St., Philadelphia 33, Pa.	Vein in slate strikes N and dips 65° W.	Active 1870s, 1890s, and around 1914. Developed by 312-ft. inclined shaft with 2 levels. Ore treated in 5-stamp mill. (MSP 3/25/71:178; Crawford 96:116; Kerr 00; Tucker 16:101-102; Logan 36:282.)
	Port Arthur				See Tollgate.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Porteous	NE of West Point	George J. Porteous, West Point (1936)	Vein in granodiorite strikes N.	Prospected 1920s and 1930s. (Logan 24:76; 36:282.)
	Potter				See Angels.
	Poverty	NE¼ sec. 14, T. 2 N., R. 11 E., M.D.M., in Salt Spring Valley, 8 mi. E of Milton	Howard J. Tower et al., Farmington	Vein in greenstone strikes N.	Prospected around 1896. Developed by shaft. (Crawford 96: 116.)
B-312	Poverty Hill	SW¼ sec. 9, T. 3 N., R. 14 E., M.D.M., 1½ mi. SE of Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N; abundant sulfides.	Long idle.
	Price	Sec. 7, T. 6 N., R. 14 E., M.D.M., on ridge S of Middle Fork of Mokelumne River, 5 mi. E of West Point	Not determined	Vein in granodiorite strikes N; abundant sulfides.	Unpatented claim. Active around 1914. (Tucker 16:101.)
B-313	Pride of Bummerville	E½ sec. 2, T. 6 N., R. 13 E., M.D.M., at Bummerville 1½ mi. E of West Point	Not determined	A 2-ft. vein in granodiorite strikes N. $60-ore was mined.	Active 1881. Developed by shaft. (MSP 10/22/81:268; Kerr 00.)
	Providence	Sec. 1, T. 4 N., R. 11 E., M.D.M., on Mother Lode 3 mi. NW of San Andreas	Not determined	Wide vein zone with greenstone hanging wall and slate footwall strikes N. 20° W. and dips NE.	Long idle. Worked through 40-ft. shaft. (Kerr 00.)
B-314	Prussian Hill (Del Monte)	Sec. 5, T. 5 N., R. 15 E., M.D.M., on ridge S of North Fork of Calaveras River, 3 mi. S of Glencoe	Not determined	A 2- to 5-ft. vein in slate strikes E and dips N.	Active 1871-74, 1897-1904, and 1914. In early 1870s yielded up to $3000 per week. Developed by 1100-ft. crosscut lower adit; 300-ft. above is 1200-ft. crosscut adit and shaft. Three 100-ft.-long ore shoots mined in upper level. Ore treated in 5- and later 10-stamp mill. (MSP 9/30/71: 195; 11/21/74:325; 3/27/97:262; 7/28/00:97; 2/13/04:118; Tucker 16:76.)
	Purdy Group	Secs. 20 and 21, T. 3 N., R. 11 E., M.D.M., on Bear Creek, 7 mi. SE of Valley Springs	Not determined	Vein in greenstone	Active prior to 1914. (Tucker 16: 101.)
B-315	Pure Quill	NW¼ sec. 4, T. 2 N., R. 13 E., M.D.M., 1 mi. SW of Angels Camp	Louis Peirano, Angels Camp	On Mother Lode. Quartz vein with stringers in slate and green schist strikes N. 45° W. and dips NE.	Active 1890s and in early 1930s. Developed by open shaft and N crosscut adit. (MSP 7/27/-95:62; Crawford 96:116.)
B-316	Quaker City	W½ sec. 26, T. 5 N., R. 11 E., M.D.M.	Quaker Gold Mining Co., c/o Mrs. James Spiers, 1366 High St., Alameda		(MSP 6/20/74:389; 7/31/86: 72; Irelan 88:144-46; Fairbanks 90:65; MSP 10/22/92: 277; Crawford 94:96; 96:116; Kerr 00; Tucker 16:101; Logan 35:146-7; herein.)
B-317	Quartz Glen (Foote and Thompson)	SW¼ sec. 26 and NW¼ sec. 35, T. 6 N., R. 12 E., M.D.M.	Percy S. Peek et al., Mokelumne Hill		(MSP 4/7/66:210; Crawford 96: 116; Kerr 00; MSP 2/17/00: 181; 6/25/10:943; Tucker 16: 101; Logan 36:256; herein.)
B-318	Ranch (McCarty, New York-Calaveras, Sherman Ranch)	SE¼ sec. 33, T. 13 N., R. 11 E., M.D.M.	Jackson D. McCarty Co., c/o Al McCarty, 1246 N. Commerce St., Stockton		(MSP 3/7/03:155; Logan 25: 159; 36:282-283; Julihn 38: 134-135; Eric 48:222; herein.)
	Rand				See Poorman.
	Raspberry				See Utica. (MSP 3/18/82:172; Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-319	Rathgeb	NW¼ sec. 34 and NE ¼ sec. 33, T. 4 N., R 12 E., M.D.M.			See Union-Rathgeb group. (MSP 1/14/65:23; 5/22/75:332; Fairbanks 90:63; Crawford 94: 96; 96:116; Kerr 00; Tucker 16:102; Logan 35:147; 36: 283; Walker 56:28-29.)
	Red Gold				See Buckhorn Consolidated.
	Red Hill	Sec. 30, T. 3 N., R. 14 E., M.D.M., near Vallecito	A. L. Griffiths, 3134 Dale St., San Diego (1936)	Two 4½-ft. veins on slate-granite contact strike NW and dip NE.	Long idle. Worked through 80-ft. shaft and 200-ft. adit. (Kerr 00.)
B-320	Red Hill	NW¼ sec. 19, T. 2 N., R. 14 E., M.D.M., 1 mi. E of Melones	Edna L. McArdle, 344 W. Park St., Stockton (1936)	Vein in schist and slate strikes N and dips E; some high-grade pockets.	Prospected early 1930s. Developed by N drift adit about 150 ft. long.
	Red Top	T. 3 N., R. 14 E., M.D.M., near Douglas Flat	S. B. Gardner, Murphys (1936)	A 3-ft. vein that strikes NW and dips SW. Slate and mica schist country rock. Ore averaged up to $25 per ton.	Prospected 1924 and 1934-36. Developed by 67-ft. inclined shaft with levels at 29 and 47 ft. (Logan 25:157; 36:283.)
	Red Wing				See Oro y Plata.
	Reed and Hillary				See Lone Star.
	Reef Rock	NE¼ sec. 13, T. 3 N., R. 13 E., M.D.M., 3 mi. NE of Angels Camp	J. Sirvain et al., P.O. Box 495, Clearlake Highlands, Lake County	Wide vein in schist and slate.	Active prior to 1896. Developed by adit and open cuts. (Crawford 96:116.)
B-321	Relief	E½ sec. 14, T. 2 N., R. 13 E., M.D.M.	Fred Stevenot, 300 Montgomery St., San Francisco		See Carson Hill. (Crawford 96: 116; Kerr 00; Storms 00:121.)
	Reserve	Sec. 13, T. 2 N., R. 13 E., M.D.M.	Fred G. Stevenot, 300 Montgomery St., San Francisco		See Carson Hill. (MSP 10/20/-83:244; Crawford 96:116; Kerr 00; Logan 35:133-4.)
B-322	Reisler Ranch	Sec. 32, T. 3 N., R. 13 E., M.D.M.			
	Rich Gulch	Sec. 2, T. 5 N., R. 12 E., M.D.M., 6 mi. NE of Mokelumne Hill, in Rich Gulch area	John C. Jens, Mokelumne Hill (1936)	Series of NE-striking veins in mica schist were mined for pockets including one that yielded $4000.	Consists of Sparrowhawk and Albert claims. Long idle. Developed by 700- and 200-ft. adits. (Logan 36:283-284.)
	Ridge View	Sec. 30, T. 6 N., R. 13 E., M.D.M., 1 mi. W of Glencoe	H. P. Warner, Glencoe	Vein with abundant sulfides in mica schist strikes N.	Intermittently active. Developed by 50-ft. open shaft. See also Glencoe group. (Kerr 00.)
B-323	Right Bower (Great Western, Western)	W½ sec. 20, T. 4 N., R. 14 E., M.D.M.	Alice Deleray, 2600 Union St., San Francisco, leased by Henry Peterson, Murphys		(MSP 9/14/72:164; 4/30/92: 318; Crawford 96:117; Tucker 16:83; herein.)
	Rindge group (Rindge No. 1, 2, and 3, Schoolhouse)				F. H. Rindge of Stockton operated a number of mines in the Glencoe-Jesus Maria area during 1923-29. See also separate headings in tabulated list. (Logan 25:157; 36:284-285.)
B-324	Rindge No. 1	S½ sec. 12, T. 5 N., R. 12 E., M.D.M., 2 mi. NE of Jesus Maria	Norman H. Roller, Mokelumne Hill	Vein in mica schist strikes N; associated with diorite dikes.	Operated 1920s by F. H. Rindge. Developed by open 740-ft. shaft with levels at 200, 300, 500, and 700 ft. Ore treated in 10-stamp mill. See also Rindge group. (Logan 36:284.)
B-325	Rindge No. 2	SW¼ sec. 13 and SE¼ sec. 14, T. 5 N., R. 12 E., M.D.M., 2 mi. SE of Jesus Maria in Wet Gulch area	Not determined	N-striking quartz veins in slate and mica schist.	Unpatented claims. Prospected 1920s by F. H. Rindge. Five quartz veins developed by +6000-ft. adit. See also Rindge group. (Logan 36:284.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-326	Rindge No. 3 (True Blue)	SW¼ sec. 29, T. 6 N., R. 13 E., M.D.M., 1 mi. SE of Glencoe	Carlo Mondani, Mokelumne Hill	A 4-ft. vein in mica schist strikes N.	Operated 1920s by F. H. Rindge. Developed by 280-ft. shaft. Ore treated in 10-stamp mill. See also Rindge group. (Logan 36:285.)
	Rio Vista	.....	.....	.....	See Patsy Bob.
B-327	Rising Sun	NE¼ sec. 19, T. 2 N., R. 14 E., M.D.M., 1 mi. E of Melones	B. and W. McArdle et al., 1406 N. Van Buren, Stockton 3	Narrow N-striking veins in slate and mica schist; some high-grade pockets.	Worked for pockets in 1890s; prospected early 1930s. (Crawford 96:117; Kerr 00.)
B-328	Ritter	SW¼ sec. 27, T. 5 N., R. 13 E., M.D.M., on ridge N of Murray Creek 2 mi. NE of Mountain Ranch	Donald H. Costello, 26641 Stanwood Ave., Hayward	A 1- to 3-ft. vein in slate strikes NW and dips NE; intersected by N-striking and E-dipping vein.	Active 1850s and 1892 to 1914. Developed by 640-ft. adit and 200-ft. shaft. Ore treated in 5-stamp mill. (MSP 7/16/92: 44; Kerr 00; Storms 00:123; Tucker 16:102.)
B-329	Riverside	W½ sec. 5, T. 6 N., R. 13 E., M.D.M., by N Fork of Mokelumne River, 2½ mi. N of West Point	Not determined	Veins in granodiorite strike N and dip W; abundant sulfides.	Active 1881-1900. Ore treated in 6-stamp mill. Developed by adit. (MSP 5/7/81:292; 11/7/91:295; Crawford 94:96; 96:117; Kerr 00; Tucker 16:102.)
	Roanoke	.....	.....	.....	See Moser.
	Roble	Sec. 6, T. 3 N., R. 14 E., M.D.M., near Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N.	Active prior to and in 1883. Ore treated in 5-stamp mill. (MSP 9/8/83:148; Kerr 00.)
	Rochester	.....	.....	.....	See Fricot group. (Kerr 00.)
	Rocky Bar	NE¼ sec. 1, T. 3 N., R. 13 E., and NW¼ sec. 6, T. 3 N., R. 14 E., M.D.M., 1 mi. NW of Murphys	Betty Cole Woodruff, 1484 Brae Bure, Altadena	Quartz vein with rich pockets in quartz-mica schist strikes N. 80° W. and dips NE.	Long idle. Developed by open shaft.
B-330	Rodden	SW¼ sec. 22, T. 1 N., R. 12 E., M.D.M., 4 mi. due S of Copperopolis	Not determined	Vein in slate strikes NW and dips NE.	Long idle. Developed by shaft.
	Rodesina	.....	.....	.....	See Rose Hill.
B-331	Romaggi and Costa	E½ sec. 10 and W½ sec. 11, T. 2 N., R. 13 E., M.D.M., 1 mi. S of Angels Camp	Not determined	On Mother Lode. Vein with phyllite footwall and greenstone hanging wall strikes NW and dips NE.	Active prior to and during 1890s. Developed by shallow shaft. (Crawford 96:106, 117; Kerr 00.)
B-332	Romaggi Family	SW¼ sec. 11, T. 2 N., R. 13 E., M.D.M., 2 mi. S of Angels Camp	Not determined	Vein on Mother Lode belt strikes NW and dips NE; green schist country rock.	Long idle. Developed by shaft. (Kerr 00.)
	Rose	Sec. 15, T. 5 N., R. 13 E., M.D.M., 4 mi. N of Mountain Ranch	Not determined	A 2½-ft. vein in slate strikes N. 18° W. and dips 80° NE.	Long idle. Worked through shallow shaft. (Kerr 00.)
B-333	Rose Hill (Rodesina)	S½ sec. 5 and N½ sec. 8, T. 4 N., R. 13 E., M.D.M., on ridge S of El Dorado Creek, 1 mi. W of Mountain Ranch	C. C. and G. Sherwood, Box 3, Mountain Ranch	A vein as much as 18 ft. wide in slate strikes NW and dips NE.	Active 1871 to 1892. Developed by 700-ft. adit and 120-ft. shaft. Ore was treated in 10-stamp mill. (MSP 1/25/73: 52; 4/20/89:276; Preston 93: 176; Crawford 96:117; Kerr 00; Tucker 16:102.)
B-334	Rosella	SW¼ sec. 3, T. 1 N., R. 11 E., M.D.M., in Buckhorn Gulch SE of Quail Hill copper mine, 2 mi. N of Telegraph City	Not determined	Vein in greenstone strikes NW and dips NE; abundant sulfides.	Active prior to 1914. Developed by 2 shafts. Ore treated in 2-stamp mill. (Tucker 16:103.)
	Rose Rock	.....	.....	.....	See Jumper.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Rothschild	Sec. 14, T. 2 N., R. 13 E., M.D.M., at Carson Hill	Not determined	Wide vein zone on Mother Lode in greenstone and slate strikes NW and dips NE.	Worked years ago through 80-ft. shaft. May be portion of Carson Hill mines. (Kerr 00.)
B-335	Rough and Ready	SW¼ sec. 13, T. 6 N., R. 13 E., M.D.M., 2 mi. N of Railroad Flat by Licking Fork of Mokelumne River	A. W. Haley, 1440 Hood Road, Sacramento	Four 2- to 4-ft. veins in slate strike N.	Active early 1920s and late 1930s; being reopened by owner. Developed by 150-ft. W crosscut adit with 200-ft. drift to S and old 300-ft. crosscut adit 100 ft. below. (Logan 36:285.)
	Royal	Sec. 23, T. 3 N., R. 10 E., M.D.M., 1 mi. E of Jenny Lind	Not determined	Wide vein zone in greenstone.	Long idle. Worked through 50-ft. shaft. (Kerr 00.)
B-336	Royal (Emma, Pine Log)	NE¼ sec. 30, T. 2 N., R. 12 E., M.D.M.	Effie M. Tower, Farmington		(MSP 12/27/84:408; 7/16/92:44; Preston 93:168; Crawford 96:117-8; Kerr 00; Storms 00:126-7; Brown 03:336; MSP 6/13/14:990; Tucker 16:103; Logan 25:157; Knopf 29:72; Logan 36:285-7; Julihn 38:117-19; herein.)
B-337	Russell (Vista)	NW¼ sec. 3, T. 2 N., R. 13 E., M.D.M., at Angels Camp	Romie Rolleri, Angels Camp (1947)	Vein with pyrite and ankerite strikes N. 30° W. and dips 65° NE; Vista vein strikes W and dips 35° N; amphibolite country rock. On Mother Lode. Value of ore was $2 to $7 per ton.	Operated 1933 to 1936 by Russell Gold Mining Company; dump recently worked for road rock. Developed by 350-ft. inclined shaft with levels at 100, 200, and 300 ft. and about 1,350 ft. of drifts and crosscuts. Ore treated in 10-stamp mill with Deister table. (Logan 36:292-294.)
	Rustler				See Dora and Homestake.
B-338	Ruth Belle	N½ sec. 30, T. 6 N., R. 13 E., M.D.M., 1 mi. W of Glencoe	C. V. Joice, 1501 23rd Ave., Oakland	Vein with abundant sulfides in mica schist strikes N.	Intermittently active. Developed by 40-ft. vertical shaft.
B-339	Ryland Cons.	Sec. 20, T. 3 N., R. 11 E., M.D.M., 5 mi. due E of Jenny Lind	Effie Tower, Farmington	Vein zone in slate and amphibolite schist strikes NW and dips NE; abundant sulfides.	Long idle. Developed by shallow shaft. (Kerr 00.)
B-340	Sacramento	Sec. 29, T. 3 N., R. 13 E., M.D.M.			
B-341	Safe Deposit	SW¼ sec. 30, T. 3 N., R. 13 E., M.D.M., on Mother Lode 1½ mi. W of Altaville and just N of Benson mine	Ada Amerman, c/o Miss Ida H. Nape, First National Bank, Scranton, Pa.	Quartz vein with greenstone hanging wall and phyllite footwall strikes NW and dips NE.	Active 1870s and early 1890s; surface intermittently prospected. Developed by shaft and adit. Ore treated in 5-stamp mill. (Preston 93:172; Crawford 94:96-97; 96:118.)
B-342	Salvador	W½ sec. 6, T. 5 N., R. 13 E., M.D.M., on Ponderosa Way, 3 mi. S of Glencoe	Mae A. Clarke, 321 W. Flora St., Stockton (1936)	A 5-ft. vein in limestone strikes N and dips E.	Active early 1900s and 1930. Developed by two drift adits. Ore treated in 8-stamp mill. (MSP 12/5/03:375; Tucker 16:103.)
	San Antonio				See Lindsey.
	San Andreas	Sec. 17, T. 4 N., R. 12 E., M.D.M., ½ mi. SE of San Andreas	B. T. Cannon, 18 E. S. Temple St., Salt Lake City, Utah (1936)	Vein in slate strikes NW.	Prospected early 1900s. (MSP 8/20/05:145; Tucker 16:104.)
B-343	San Bruno (Good Hope)	NW¼ sec. 20, T. 6 N., R. 13 E., M.D.M., 1 mi. NE of Glencoe	Myrtle Rader et al., Glencoe	A 4- to 6-ft. vein in slate and schist with diorite dikes strikes N and dips 60° W.	Extensively worked 1860s and 1870s when output was as much as $10,000 per month. Developed by series of drift adits. (MSP 11/10/66:294; 7/4/74:5; Tucker 16:82.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Sanchez				See Janie Boyd.
B-344	Sanderson	SW¼ sec. 35, T. 6 N., R. 13 E., M.D.M.	Mrs. Amelia Stotts, R.F.D. Box 35, Mokelumne Hill		(MSP 10/30/69:278; 10/5/72: 212; Logan 36:287; herein.)
	Sandwich				See Collier.
	San Justo				See Carson Creek.
B-345	San Pedro	E½ sec. 19, T. 6 N., R. 13 E., M.D.M., ½ mi. N of Glencoe	Clarence E. Berry, Valley Springs	Vein in quartz-mica schist strikes N.	Long idle. Developed by shaft.
	Santa Ana				See Peirano.
B-346	Santa Cruz				See Carson Hill.
B-347	Sarah	W½ sec. 24, T. 2 N., R. 12 E., M.D.M., 3 mi. NE of Copperopolis	C. E. Longton et al., 1109 38th St., Sacramento (1936)	Vein in greenstone strikes NW and dips NE.	Long idle. Developed by shaft.
	Saratoga	Sec. 30, T. 6 N., R. 13 E., M.D.M., near Glencoe	Not determined	A 2-ft. vein in granodiorite strikes NW.	Long idle. Worked through 90-ft. adit and shallow shaft. (Kerr 00.)
	Scannon	Sec. 28, T. 4 N., R. 12 E., M.D.M., 2 mi. S of San Andreas	Not determined	A 30-ft. vein zone in slate strikes NW and dips NE.	Long idle. Worked through 65-ft. shaft and open cut. (Kerr 00.)
	Schoolhouse	SE¼ sec. 11, T. 5 N., R. 12 E., M.D.M., 1 mi. NE of Jesus Maria	W. A. Hughes, Mokelumne Hill	Vein in quartz mica schist strikes N.	Operated 1920s by F. H. Rindge. Vein developed by 170-ft. shaft. Ore treated in 5-stamp mill. See also Rindge group. (Logan 36:285.)
	Scieffard				See Everlasting.
	Scorpion	NW¼ sec. 11, T. 6 N., R. 13 E., M.D.M., 1 mi. SE of West Point	Hilderbrandt, Posner & Co., c/o Dr. M. M. Posner, 2491 Washington St., San Francisco	Vein in granodiorite strikes N; abundant sulfides.	Active 1880s. (MSP 6/24/84: 436; Tucker 16:104.)
	Seattle	Sec. 36, T. 5 N., R. 11 E., M.D.M., 4 mi. S of Mokelumne Mill	Not determined	Vein in slate and greenstone strikes NW and dips NE.	Long idle. Worked through several shallow shafts and open cuts. (Kerr 00.)
B-348	Senica	NE¼ sec. 15, T. 6 N., R. 13 E., M.D.M., 2 mi. NE of Railroad Flat, by S Fork of Mokelumne River	John T. Senica, Railroad Flat	A 3- to 5-ft. vein with abundant sulfides and calcite and associated with diorite dikes in mica schist strikes N. 70° W. and dips 65° NE.	Active many years ago and intermittently since 1957. Developed by open SE drift adit and open stopes.
	Shaw	Sec. 30, T. 4 N., R. 14 E., M.D.M., on ridge between San Domingo Creek and Sullivan Gulch, 3 mi. N of Murphys	Not determined	A 2-ft. vein in slate and serpentine.	Unpatented claim. Active during 1890s. Developed by 245-ft. crosscut adit and 145-ft. shaft. (Crawford 96:119; Tucker 16: 104.)
B-349	Sheep Ranch	SE¼ sec. 7, T. 4 N., R. 14 E., M.D.M.	G. D. Martin, Sheep Ranch		(MSP 3/18/71:163; 12/1/77: 341; Irelan 87:30; 88:121-133; Preston 93:175-6; Turner 94:6; Crawford 94:96; MSP 9/14/ 95:168; Crawford 96:119; Kerr 00; Storms 00:104-5; Tucker 16:104-5; MSP 1/29/21:172; Hamilton 22:27-8; Logan 23c: 17; 25:158-9; 36:288; Julihn 38:110-12; Eric 48:222; herein.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-350	Shenandoah (Hoosier, Mary Lowrey, Way)	N½ sec. 24, T. 5 N., R. 12 E., M.D.M., on Jesus Maria Creek, 5 mi. NW of Mountain Ranch	J. S. Jack et al., San Andreas (1936)	A 2- to 5-ft. vein in mica schist and quartzite strikes NE and dips NW; amphibolite schist lies E.	Consists of three claims. Active 1890s, 1916, 1923, and 1936. Developed by 1,500- and 1,600-ft. adits and 500-ft. shaft. Ore treated in 10-stamp mill. (Preston 93:176; Crawford 94: 96-97; 96:119; Kerr 00; Tucker 16:105-106; Logan 36:289.)
	Sheridan	T. 2 N., R. 13 E., M.D.M., SW of Melones	Not determined	A 2- to 10-ft. vein in slate developed by adit.	Prospected around 1893. (Crawford 94:97; 96:119.)
	Sherman Ranch				See Ranch.
B-351	Shotgun	SE¼ sec. 16, T. 3 N., R. 12 E., M.D.M., on Cherokee Creek, 6 mi. NW of Angels Camp	C. J. Tiscornia, San Andreas	Quartz stringers in slate strike NW and dip NE.	Active 1899, 1914, and 1930. Developed by several shallow shafts. (MSP 11/18/99:581; Kerr 00; Tucker 16:106; Logan 35:147.)
B-352	Sierra King	W½ sec. 20, T. 6 N., R. 13 E., M.D.M., 1 mi. NE of Glencoe	Haslett Warehouse Co., 680 Beach St., San Francisco 9	Vein in mica schist and slate strikes N.	Prospected 1930s. Developed by shaft. See also Glencoe group. (Kerr 00.)
B-353	Sierra Queen	Sec. 20, T. 6 N., R. 13 E., M.D.M., 1 mi. NE of Glencoe in Mosquito Gulch	Haslett Warehouse Co., 680 Beach St., San Francisco 9	Quartz vein with abundant pyrites and calcite in mica schist strikes N.	Active 1870s and 1880s; prospected in 1930s. Developed by W-crosscut caved adit. Ore treated in 4-stamp mill. See also Glencoe group. (Kerr 00; Logan 36:292.)
	Single Standard	T. 3 N., R. 13 E., M.D.M., 2 mi. W of Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N.	Worked for pockets early 1890s. (Crawford 96:119.)
	Sixteen-to-One	Sec. 15, T. 5 N., R. 13 E., M.D.M., 5 mi. N of Mountain Ranch	Not determined	A 1-ft. vein in slate strikes N. 7° W. and dips 85° NE.	Long idle. Worked through 50-ft. shaft. (Kerr 00.)
	Slate Creek	Sec. 6, T. 3 N., R. 11 E., M.D.M., 4 mi. S of Valley Springs	Not determined	A 2-ft. vein in greenstone strikes N.	Unpatented claim. Active 1890s and 1900. Developed by adit and shaft. (Crawford 96:119-120; Kerr 00; MSP 8/4/00: 126.)
B-354	Smith	SW¼ sec. 18, T. 3 N., R. 14 E., M.D.M., 2½ mi. SW of Murphys	Not determined	Vein in quartz-mica schist strikes W and dips N; abundant sulfides.	Long idle. Developed by shaft.
	Smith and Crooks	SW¼ sec. 11, T. 2 N., R. 13 E., M.D.M., 2½ mi. S of Angels Camp	K. Collins, et al., Rt. 2, Box 625, Oakdale	On Mother Lode. A 20-50 ft. vein zone strikes NW and dips NE.	Active 1914. (Tucker 16:106.)
	Smyth				See Angels Deep. (Tucker 16: 106.)
B-355	Smythe	W½ sec. 30, T. 3 N., R. 14 E., M.D.M., on Red Hill, ¼ mi. W of Vallecito	Not determined	Vein in quartz-mica schist strikes NW.	Unpatented claim. Active prior to 1896. Developed by shaft and drifts. (Crawford 96:120; Tucker 16:106.)
	South Bank				See Mar John. (MSP 3/18/71: 163; Kerr 00; Tucker 16:106.)
B-356	Soap Root	NE¼ sec. 11, T. 6 N., R. 13 E., M.D.M., 1 mi. S of West Point	Not determined	A 2½-ft. vein in granodiorite strikes NW and dips NE; abundant sulfides.	Active 1870s to 1890s; prospected 1949 by M. B. Haley. Developed by shaft. (MSP 7/ 27/72:52; 6/25/87:416; Kerr 00; Tucker 16:106.)
B-357	Sonoma	NW¼ sec. 30, T. 4 N., R. 14 E., M.D.M., 3 mi. N of Murphys by Indian Creek	E. W. Farnsworth et al., 1326 E. Harvard, Glendale 5	A 5-ft. vein in mica schist strikes W and dips N.	Active prior to and in 1904; prospected early 1930s. Developed by 125- and 110-ft. shafts. (Kerr 00; MSP 10/15/ 04:262; Tucker 16:106; Logan 36:289.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-358	Soren	SW¼ sec. 26, T. 7 N., R. 13 E., M.D.M., at Skull Flat 2 mi. N of West Point	Soren Christiansen, West Point (1936)	Vein in granodiorite strikes N; abundant sulfides.	Long idle. Developed by adit.
B-359	South Carolina	N½ sec. 24, T. 2 N., R. 13 E., M.D.M.	Fred G. Stevenot, 300 Montgomery St., San Francisco	.....	See Carson Hill. (Crawford 94:97; MSP 11/9/95:306; Crawford 96:120; Tucker 16:107.)
B-360	South Paloma	SW¼ sec. 27 and SE¼ sec. 28, T. 5 N., R. 11 E., M.D.M., 1 mi. N of Paloma	J. H. Steleman, T. E. McSorley et al., Mokelumne Hill	Vein in black Mariposa slate strikes N.	A south extension of the Gwin mine. Active prior to and during 1890s. See also Gwin mine. (Crawford 96:120; MSP 5/21/98:537.)
	Southwell	.....	.....	.....	See Angels.
B-361	Sparrow Hawk	W½ sec. 2, T. 5 N., R. 12 E., M.D.M., at Rich Gulch, 5 mi. E of Mokelumne Hill	Anna M. Hansen, P.O. Box 386, Belmont	A 3-ft. vein in slate strikes NW and dips NE.	Active 1888 to around 1900. Developed by shafts and open cut. (MSP 9/1/88:144; 9/29/00:377; Kerr 00.)
B-362	Specimen	N½ sec. 3, T. 3 N., R. 12 E., M.D.M., by Highway 49, 3 mi. S of San Andreas	John Guttinger, San Andreas	Vein in slate and phyllite strikes NW and dips NE.	Long idle. Developed by shaft. (MSP 9/19/96:242; Kerr 00; Logan 36:292.)
	Spotted Pup	Sec. 22, T. 5 N., R. 12 E., M.D.M., 1 mi. SE of Jesus Maria	Ed King, San Andreas (1936)	A 10-ft. vein strikes NE and dips NW.	Prospected 1936. Developed by 100-ft. adit. (Logan 36:289.)
B-363	Spring Day	SE¼ sec. 19, T. 6 N., R. 13 E., M.D.M., at Glencoe	Ruby S. Jones et al., c/o Bernice Hickinbotham, 1815 N. Hunter St., Stockton	A 2-ft. quartz vein in slate strikes N. 10° W. and dips 65° NE.	Active around 1914. Developed by shallow shaft. (Tucker 16:107.)
	Spring Gulch	Sec. 35, T. 7 N., R. 13 E., M.D.M., on ridge S of Skull Flat Gulch, 2½ mi. NW of West Point	Not determined	Vein in granodiorite strikes N; abundant sulfides.	Unpatented claim. Prospected 1896 and 1914. (Crawford 96:120; Tucker 16:107.)
	Standard (Early Bird)	Sec. 18, T. 6 N., R. 14 E., M.D.M., on Licking Fork of Mokelumne River, 3 mi. SE of West Point	Not determined	Vein in granodiorite strikes N; abundant sulfides.	Unpatented claim. Active around 1914. (Tucker 16:108.)
B-364	Stand By	NE¼ sec. 35, T. 6 N., R. 13 E., M.D.M., 2 mi. E of Railroad Flat	Harry Buchanan, Rt. 1, Box 33B, Mokelumne Hill	A 1- to 3-ft. vein strikes N and dips 64° E; quartz-mica schist country rock.	Prospected in mid-1920s and 1934. Developed by 70-ft. inclined shaft with 400-ft. drift on 65-ft. level. Ore treated in mill with ball mill, plate, and vanner. (Kerr 00; Logan 25:153; 36:288.)
B-365	Stanislaus	.....	.....	.....	See Carson Hill.
B-366	Starlight	SE¼ sec. 17, T. 4 N., R. 13 E., M.D.M., 6 mi. E of San Andreas	John R. Ross, Star Route, San Andreas	Quartz vein with parallel stringers in slate and schist strike N. Concentrates averaged $162 per ton.	Active prior to and during early 1890s; 1940s and early 1950s. Developed by 145-ft. shaft now caved. Ore treated in 5-stamp mill. (Crawford 96:120; Kerr 00; Tucker 16:107.)
	Star of India (Curtis)	NE¼ sec. 5, T. 2 N., R. 13 E., M.D.M., 2 mi. W of Angels Camp	Ethel I. Calahan, P.O. Box 384, Burlingame	A 40- to 50-ft. vein zone on Mother Lode that strikes NW and dips NE.	Active 1890s. Developed by adit and shafts. (MSP 6/10/93:358; Crawford 94:97; 96:120.)
B-367	Star of the West	SE¼ sec. 26, T. 7 N., R. 13 E., M.D.M., at Skull Flat, 3 mi. NE of West Point	Chas. Harker, Humboldt Bank Bldg., San Francisco (1936)	An 18-inch vein in granodiorite strikes NW and dips SW; abundant sulfides.	Active 1880s, 1910-13, and early 1930s. Developed by 275-ft. shaft. Ore treated in 10-stamp mill. (MSP 9/2/82:332; Kerr 00; Tucker 16:107; Logan 25:151-152.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Stars and Stripes	T. 2 N., R. 10 E., M.D.M., 2½ mi. NE of Milton	Not determined	Vein in greenstone strikes N.	Active prior to 1896. (Crawford 96:120.)
	Starvation	Sec. 13, T. 4 N., R. 12 E., M.D.M., 5 mi. E of San Andreas	Not determined	A 4-ft. vein in slate strikes W and dips N.	Long idle. Worked through 25-ft. shaft. (Kerr 00.)
	Steger	Sec. 5, T. 6 N., R. 13 E., M.D.M., 3 mi. W of West Point	Allen Smith, West Point (1936)	An 18-inch vein in granodiorite strikes NW and dips SW; sulfides abundant.	Consists of Steger and Josephine claims. Active 1870s, around 1914, and 1936. Developed by a 450-ft. adit and two shafts. Ore treated in 3-stamp mill. (MSP 2/3/72:68; Tucker 16:108; Logan 23a:21; 36:289.)
	Stephens				See Carson Hill.
	St. Gothard				See Columbus.
	Stickle				See Utica. (MSP 10/3/66:230; 6/28/73:402; Irelan 87:28; 88:124-26; MSP 3/31/94:195; Kerr 00; Ransome 00:9.)
	St. Lawrence				See Bruner.
B-368	Stoetzer	N½ sec. 19, T. 6 N., R. 13 E., M.D.M., 1 mi. N of Glencoe	Haslett Warehouse Co., 680 Beach St., San Francisco 9	Vein in mica schist and slate strikes N.	Prospected 1930s. Developed by shaft. See also Glencoe group (Kerr 00.)
	Stonewall	Sec. 7, T. 3 N., R. 14 E., M.D.M., 2½ mi. SW of Murphys	George S. Taylor, Murphys (1936)	Vein in mica schist strikes NW.	Active 1890s. Developed by 300- and 620-ft. crosscut adits and 85-ft. shaft. (Crawford 96:120; Logan 36:289.)
B-369	Stonewall Jackson	NE¼ sec. 31, T. 6 N., R. 13 E., M.D.M., on ridge N of North Fork Calaveras River, 2 mi. S of Glencoe	Ernest Allen, Glencoe	A 3-ft. vein in slate and schist strikes N and dips E.	Active 1880s; prospected 1954 and 1955. Developed by two W-trending crosscut adits and drifts. (MSP 1/29/87:68; Tucker 16:108.)
	Stramatis				See Alpha and Omega.
	Suffolk				See Angels Deep. (Irelan 88:126-29; MSP 3/23/89:202; Brown 90:147; Fairbanks 90:60; MSP 7/9/92:28; Crawford 94:97.)
	Sugar Pine	Sec. 2, T. 3 N., R. 13 E., M.D.M., 3 mi. W of Murphys	Not determined	A 4-ft. vein in slate strikes W and dips N.	Active 1897-1902. Developed by 100-ft. shaft, open cut, and adit. Ore treated in 5-stamp mill. (MSP 2/13/97:134; Kerr 00; MSP 4/12/02:208.)
B-370	Sultana (Bovee, Cushing, Fritz)	N½ sec. 33 and S½ sec. 28, T. 3 N., R. 13 E., M.D.M., at Angels Camp	Golden Lode Mining Co., c/o R. R. Woolley, 6535 Wilshire Blvd., Los Angeles 48	On Mother Lode. Two 5- to 14-ft. veins in green schist strike NW and dip NE.	Extensively worked 1852 to 1872; intermittently active to 1905. Developed by 700-ft. vertical shaft with levels at 100, 300, and 700 ft. Ore treated originally in 10-stamp mill, later in 20-stamp mill. (MSP 1/30/69:70; 10/26/95:270; 11/16/95:322; Crawford 96:104; Kerr 00; Storms 00:119; Tucker 16:108; Logan 35:147-148.)
B-371	Summit	SE¼ sec. 11, T. 5 N., R. 13 E., M.D.M., on Esperanza Creek, 3½ mi. S of Railroad Flat	Walter Shackleford, Angels Camp	A 2-ft. vein in mica schist with diorite dike strikes N. 15° W. and dips 45° NE; ore yielded $6 per ton.	Active prior to 1914 and again in 1930s. Developed by open SE 50-ft. drift adit. (Tucker 16:108.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and reference
B-372	Summit	Secs. 30, 31, T. 6 N., R. 13 E., M.D.M.			
B-373	Sunny Side	SW¼ sec. 23, T. 2 N., R. 13 E., M.D.M., 2 mi. W of Melones and just W Carson Creek mine	Not determined	On Mother Lode; vein in phyllite and greenstone strikes NW and dips NE.	Long idle.
	Sunrise	Secs. 30 and 31, T. 3 N., R. 14 E., M.D.M., on E slope of Red Hill, ½ mi. SW of Vallecito	Not determined	A 3-ft. vein in slate and granite strikes NE.	Active around 1914. Developed by 2 adits. (Tucker 16:108-109.)
	Sunrise	NE¼ sec. 34, T. 4 N., R. 13 E., M.D.M., near Esmeralda School	Lillian P. Davis, 2872 Jackson St., San Francisco (1936)	Vein in mica schist strikes W and dips N.	Prospected prior to 1914. (Kerr 00; Tucker 16:108.)
B-374	Surf & Cordes	W½ sec. 4, T. 1 N., R. 13 E., M.D.M., 2 mi. NW of Melones Dam	Not determined	Vein strikes NW and dips NE; serpentine and greenstone country rock.	Long idle prospect.
B-375	Swallow	Sec. 5, T. 6 N., R. 13 E., M.D.M.			
B-376	Sweepstakes	E½ sec. 33, T. 7 N., R. 13 E., M.D.M., 2 mi. NW of West Point and just S of West Point power house	Franklin Garbarini, Sr., Jackson	Narrow quartz vein in granodiorite strikes N and dips W.	Located 1955; intermittently prospected since. Developed by shallow inclined shaft.
B-377	Swiss	S½ sec. 29, T. 6 N., R. 14 E., M.D.M., 3½ mi. due E Railroad Flat and just N Fine Gold mine	W. P. Caubu, c/o F. R. Drinkhouse, 1257 Shrader St., San Francisco	Vein of white to gray quartz in slate and hornfels strikes N and dips W; sulfides abundant.	Active early 1900s; prospected in 1930s. Developed by open 200-ft. shaft and drifts.
B-378	Table Mountain	NE¼ sec. 3, T. 4 N., R. 13 E., M.D.M., 1 mi. NE of Mountain Ranch	Annie M. Raggio, Angels Camp (1936)	Vein in mica schist and slate strikes E and dips N.	Long idle. Worked through 110-ft. shaft. (Kerr 00.)
B-379	Table Mountain	SW¼ sec. 1, T. 4 N., R. 13 E., M.D.M., 2 mi. NW of Sheep Ranch	California Trust Co., 629 So. Spring St., Los Angeles (1936)	Vein in mica schist strikes NW; abundant sulfides.	Long idle.
	Tandee	T. 4 N., R. 14 E., M.D.M., 1 mi. N of Sheepranch on O'Neil's Creek	D. T. Jones, Sheepranch (1936)	Vein that may be N extension of Sheepranch vein.	Prospected around 1936. Developed by open cuts. (Logan 36: 289-290.)
B-380	Tangier	SW¼ sec. 30, T. 6 N., R. 13 E., M.D.M., 1 mi. SW of Glencoe	Thomas Taylor, Railroad Flat	Vein in mica schist strikes N and dips E; several high-grade pockets.	Long idle. Developed by open drift adit and inclined shaft. (Kerr 00.)
B-381	Tanner	SE¼ sec. 32, T. 4 N., R. 14 E., M.D.M., on Chaparral Hill, 1½ mi. NE of Murphys	Not determined	An 8-inch vein in slate strikes N. 30° E. and dips 70° SE; abundant sulfides.	Active 1913 to early 1920s. Developed by 700-ft. adit. Ore treated in 2-stamp and 7-stamp mills. (Tucker 16:109; MSP 10/25/19:618; Logan 23b:98.)
	Tate	Sec. 10, T. 5 N., R. 13 E., M.D.M., 4 mi. SW of Railroad Flat	John Tate, Lodi (1936)	Vein up to 12 ft. wide with abundant sulfides in mica schist strikes N.	Active 1932-34. Developed by 150-ft. shaft. Ore treated 4-stamp mill. (Logan 36:290.)
B-382	Taylor (Mascot)	NE¼ sec. 11, T. 3 N., R. 14 E., M.D.M., in Collierville district 4 mi. due E of Murphys	L. W. and H. K. Barnes, Box 255, Murphys	Two parallel 3-ft. veins in slate and mica schist with some quartzite strike W and dip 40° N.	Worked many years ago; prospected by G. E. Mayer in 1936. Developed by 225-ft. adit and 85-ft. vertical shaft, both caved, and open cuts. Ore treated in 5-stamp mill. (Kerr 00; Logan 36:274.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-383	Tecumseh	NE¼ sec. 11 and NW ¼ sec. 12, T. 1 N., R. 11 E., M.D.M., 2 mi. NE of Telegraph City in Texas Gulch	Sophia and Doris J. Murphy, 728 W. Acacia St., Stockton	A 5-ft. vein in greenstone and talcose schist strikes N. 10° W. and dips 75° SW; sulfides abundant in vein and adjacent wall rock. Ore yielding $25 to $40 per ton was mined.	Gold and copper mine. Extensively worked in early 1870s; cement copper may have been produced later. Developed by open shaft at least 400 ft. deep with levels at each 100 ft. Ore treated in 10-stamp mill. (MSP 8/24/72:116; 5/24/73:325; 11/15/73:314; Kerr 00.)
	Telluride Group	T. 4 N., R. 14 E., M.D.M., 3 mi. N of Murphys	Minnie Hengen, San Andreas (1936)	Vein in mica schist strikes NW.	Consists of two claims. Prospected early 1930s. Developed by 30-ft. shaft and 100-ft. adit. (Logan 36:290.)
	Tellurium				See Bence.
B-384	Texas	NE¼ sec. 11, T. 4 N., R. 10 E., M.D.M., 2 mi. NW Valley Springs	J. R. Hoskinson et al., 810 N. Linden Drive, Beverly Hills (1936)	Narrow quartz stringers strike N. 50° W. and dip NE.	Active prior to and during 1935-36. Developed by 85-ft. shaft and 1,500 ft. of drifts. Ore treated in 5-ton pilot mill. (Logan 36:290.)
B-385	Thomas Brothers claims	NE¼ sec. 23, T. 4 N., R. 13 E., M.D.M., 1 mi. S of Cave City by O'Neil's Creek	E. A. Thomas et al., Mountain Ranch	A series of claims on narrow N- and E-trending veins in mica schist; some high-grade pockets. Limestone to NE.	Developed by short drift adits and open cuts; prospected intermittently. Claims are the H.O., Yellow Bird, Golden Poppy, Lucky Boy, Rose Marie, Tip Top, Coarse Gold, Mt. Bullion, Cave City, and A 1. (Logan 36:277; Clark 54: 20.)
	Thorn				See Pioneer Chief.
	Thorne				See Illinois.
B-386	Thorpe	SW¼ sec. 11, T. 3 N., R. 12 E., M.D.M.	N. F. and G. L. Ponte, San Andreas		(MSP 3/18/71:163; Fairbanks 90:63; MSP 9/19/91:180; Crawford 96:121; Kerr 00; MSP 3/11/16:384; Tucker 16: 109; Logan 35:143; herein.)
	Tiger				See Ilex.
	Tip Top	Sec. 3, T. 3 N., R. 12 E., M.D.M., near Fourth Crossing	Not determined	Vein zone as much as 50 ft. thick strikes NW and dips NE. On Mother Lode.	Long idle. Developed by open cut and shallow shaft. (Kerr 00.)
B-387	Tollgate (Port Arthur)	NE¼ sec. 32, T. 3 N., R. 13 E., M.D.M., 1 mi. W Angels Camp	Cora B. Meyers, Angels Camp	On Mother Lode. Vein in amphibolite strikes N. 45° W. and dips NE. Last ore milled yielded $7.50 per ton.	Active prior to 1892 and intermittently thereafter to 1925. Developed by 150-ft. inclined shaft with levels at 100 and 150 ft. Ore treated originally in 20-stamp mill and later in 3-stamp mill with vanner. (Preston 93: 171; MSP 3/22/02:165; Tucker 16:101; Hamilton 22: 28; Logan 25:159-160; 35: 148.)
	Tolman				See Gold Star.
B-388	Tom Smith	SW¼ sec. 7, T. 4 N., R. 14 E., M.D.M., on ridge between San Antonio and O'Neils Creeks, 1 mi. NW of Sheep Ranch	Calaveras Cons. Mining Co., c/o Albert Stastny, 4111 SE. Bybee, Portland 2, Oregon	An 18-in. vein strikes N. 56° W. and dips 45° NE.	Active 1889, 1902 and 1914. Developed by 400- and 800-ft. adits. (MSP 4/20/89:276; 12/20/02:358; Tucker 16: 110; Logan 36:290.)
	Tone	Sec. 10, T. 5 N., R. 13 E., M.D.M., 3 mi. SW of Railroad Flat	Not determined	A 4-ft. vein in mica schist.	Active 1890. Developed by 200-ft. adit. (MSP 5/24/90:348; Kerr 00.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-389	Toon	Sec. 18, T. 4 N., R. 14 E., M.D.M.	G. D. Martin, Sheep Ranch		Part of Sheep Ranch mine which see. (Kerr 00.)
B-390	Total Wreck	NW¼ sec. 6, T. 3 N., R. 14 E., M.D.M., 1 mi. W of Murphys	Louise C. and John J. Snyder, Box 536, Valley Springs	A 4- to 5-ft. vein in mica schist strikes N. 70° W.	Active 1880s, 1890s, and 1936-38. Developed by 150-ft. vertical open shaft. Ore treated in 5-stamp mill. (MSP 5/25/89: 376; 6/21/90:414; Crawford 96:121; Kerr 00; Logan 36: 290-91.)
	Tracy (G.A.R.)	Sec. 2, T. 2 N., R. 13 E., M.D.M., near Angels Camp	Royal A. Miller et al., 1265 26th Ave., San Francisco	On Mother Lode. A 40-ft. vein zone with greenstone hanging wall and slate footwall strikes NW and dips NE.	Active prior to and during 1890s. Developed by 180-ft. shaft. (MSP 5/22/97:434; Kerr 00.)
B-391	Triple Lode (Blair, El Dorado)	S½ sec. 32, T. 3 N., R. 13 E., M.D.M.	J. B. Demaria, and Margaret Gianera, 214 Columbus Ave., San Francisco		(Preston 93:172; MSP 12/29/94:413; Crawford 94:90, 97; 96:98; Tucker 16:70; Hamilton 22:28-29; Logan 23b:98; 23c:18; 25:160; 35:148-149; herein.)
	True Blue				See Rindge No. 3.
	Tryon (Greenstone)	NW¼ sec. 3, T. 2 N., R. 13 E., M.D.M., at Angels Camp	Walter W. Tryon, P.O. Box 1093, Rio Vista	Vein up to 24 ft. thick in slabby greenstone strikes NW and dips NE.	Active prior to and around 1897; mined for roofing granules from 1925 to 1941. Developed by 325-ft. shaft with levels at 100, 200, and 300 ft. and adit. See also under stone. (Crawford 96: 121; MSP 11/20/97:486; Tucker 16:110; Logan 25:168-169; 36:235.)
B-392	Tulloch	SW¼ sec. 11 and NW¼ sec. 14, T. 2 N., R. 13 E., M.D.M.	Utica Mines, Inc. et al., 220 Montgomery St., San Francisco		(Crawford 94:98; MSP 11/2/95: 286; Crawford 96:121; Storms 00:121; Tucker 16:110; Logan 25:160; 35:149; 36:291; herein.)
	Tupper Creek	T. 3 N., R. 14 E., M.D.M., near Douglas Flat on Tupper Creek	S. B. Gardner, Murphys (1936)	Three parallel veins in slate and mica schist strike N.	Consists of 3 claims, worked in 1936. Developed by 150-ft. adit and open cuts. Ore treated in mill containing jaw crusher, ball mill, plate, and table. (Logan 36:283.)
	Twin Oaks (Bumstead)	T. 4 N., R. 14 E., M.D.M., 4 mi. N of Murphys	Twin Oaks Mining Co., 1823 Van Ness Ave., San Francisco (1936)	A 1- to 4-ft. vein in mica schist and slate strikes W and dips S; contained $9 ore.	Active early 1930s. Developed by 150-ft. crosscut adit and connecting 90-ft. shaft. Ore treated in a Nenzel mill. (Logan 36:291.)
	Union				See Carson Hill.
B-393	Union Cons.	SW¼ sec. 12, T. 5 N., R. 11 E., M.D.M., 1 mi. W of Mokelumne Hill	F. O. Proctor, Murphys (1936)	Vein in slate strikes NW.	Long idle.
B-394	Union	Sec. 33, T. 4 N., R. 12 E., M.D.M.	John Guttinger, San Andreas		See Union-Rathgeb group. (MSP 4/22/71:244; Irelan 88:147; Fairbanks 90:63; Crawford 94: 96; 96:116; Kerr 00; Tucker 16:110; Logan 36:291-292.)
	Union-Rathgeb group (Rathgeb, Union, Cordova)		John Guttinger, et al., San Andreas		(Herein.)
	Uno				See Empire.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-395	Utica (Brown, Confidence, Dead Horse, Jackson, Little Nuggett, Raspberry, Stickles, Washington)	Secs. 33 and 34, T. 3 N., R. 13 E., M.D.M.	Utica Mines, Inc., 220 Montgomery St., San Francisco	.....	(MSP 4/27/72:260; 7/11/85: 24; Irelan 87:28-29; 88:122-26; Fairbanks 90:61; Brown 90:150-51; MSP 2/21/91: 114; Crawford 94:98-99; 96: 121-22; MSP 2/22/96:150; Kerr 00; Ransome 00:9; Storms 00:111-119; Tucker 16:110-112; Logan 35:149-51; herein.)
B-396	Valentine.....	N½ sec. 19, T. 6 N., R. 13 E., M.D.M., just N of Glencoe	Haslett Warehouse Co., 680 Beach St., San Francisco	E-striking vein in mica schist.	Active 1870s, 1880s, prospected 1935. Developed by 350-ft. crosscut adit. Ore treated in 20-stamp mill. (MSP 11/24/77:322; 10/29/81:282; Kerr 00; Logan 36:292.)
	Valentine, Jr....	.....	.....	.....	See Angels.
	Vanderbilt.....	.....	.....	.....	See Chaparral Hill group. (MSP 7/16/81:36; Kerr 00; Tucker 16:74.)
	Venus.....	Sec. 7, T. 4 N., R. 13 E., M.D.M., 3 mi. SW of Mountain Ranch	Not determined.....	Vein up to 20 ft. thick in slate strikes NE and dips SE.	Long idle. Worked through 50-ft. shaft and 100-ft. adit. (Kerr 00.)
	Veritas.....	.....	.....	.....	See Fellowcraft.
	Virginia.....	Sec. 22, T. 5 N., R. 11 E., M.D.M., near the Gwin mine 2 mi. N of Paloma	Not determined.....	An 8-ft. vein in slate strikes N and dips E.	Long idle. Worked through 70-ft. shaft and 80-ft. adit. (Kerr 00.)
	Virginia.....	.....	.....	.....	See Black Oak.
	Vista.....	.....	.....	.....	See Russell.
B-397	Vonich.....	NW¼ sec. 21, T. 2 N., R. 13 E., M.D.M., 4 mi. SW of Angels Camp in Vonich Gulch	John P. Vonich et al., Angels Camp	Vein in slate and green schist strikes N. 25° W. and dips 60° NE.	Active around 1903. Developed by W crosscut adit and 195-ft. shaft. (MSP 9/26/03:207; Tucker 16:112.)
B-398	Wagon Rut.....	E½ sec. 32, T. 3 N., R. 13 E., M.D.M., 1½ mi. W of Angels Camp	Violet Miller, 971 Mission St., San Francisco (1936)	On Mother Lode. Vein with phyllite and slate footwall and green schist hanging wall strikes N. 60° W. and dips NE.	Extensively worked many years ago. Developed by open inclined shaft.
	Washington.....	Sec. 19, T. 4 N., R. 13 E., M.D.M., 1 mi. SW of San Andreas	Not determined.....	On Mother Lode. Two veins as much as 14 ft. thick in greenstone and slate strike NW and dip NE.	Active 1898. Developed by 128-ft. shaft. (MSP 11/19/98:509; Kerr 00.)
B-399	Washington (Bullion Hill, McNair)	E½ sec. 20, T. 4 N., R. 14 E., M.D.M.	Mary Jane Osselin, Sheep Ranch	.....	(MSP 4/27/72:260; Crawford 94:99; 96:122; Kerr 00; MSP 1/15/10:141; Tucker 16:73, 112; Hamilton 22:25-26; Logan 23b:98; 23c:17; 24:4-5; 25:160-161; herein.)
	Washington.....	.....	.....	.....	See Utica.
B-400	Water Lily.....	E½ sec. 2, T. 6 N., R. 13 E., M.D.M., 1 mi. E of West Point	B. F. Porter Estate, c/o W. T. Sesnon, Holbrook Bldg., San Francisco (1936)	A 1- to 4-ft. vein of dark quartz with abundant sulfides in granodiorite strikes N. 15° W. and dips 80° SW; 200-ft. ore shoot.	Considerable activity during 1880s; mostly idle since. Developed by 230- and 125-ft. shafts. Ore treated in 3-stamp mill. (MSP 9/25/86:204; Irelan 88:141; Crawford 94:90; 96:122; Kerr 00; Tucker 16: 112; Logan 23a:21.)

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and referenc
B-401	Waterman (Fairfax)	NW¼ sec. 3, T. 2 N., R. 13 E., M.D.M., in Angels Camp	Norma A. K. Grimes et al., c/o Mrs. D. A. Grimes, 6436 Collette Way, North Highland	On Mother Lode. A 5-ft. vein with pyrite and ankerite strikes N. 20° W. and dips 55° NE; green schist footwall and metagabbro hanging wall.	Extensively worked many years ago, diamond drilled in 1914. Developed by open inclined shaft. (Tucker 16:112; Logan 35:151.)
B-402	Watson	E½ sec. 32, T. 3 N., R. 12 E., M.D.M., 2 mi. W of Copperopolis	J. B. Watson et al., First National Bank Bldg., Stockton (1936)	Vein in slate and greenstone strikes NW and dips NE.	Long idle. Developed by shaft.
	Way				See Shenandoah.
	Wesson	Sec. 18, T. 4 N., R. 12 E., M.D.M., 1 mi. W of San Andreas	Not determined	Mineralized zone up to 60 ft. thick in slate strikes NW and dips NE. On Mother Lode.	Active prior to and in 1883. Developed by 40-ft. shaft. (MSP 3/10/83:164; Kerr 00.)
B-403	Wet Gulch	Sec. 27, T. 6 N., R. 13 E., M.D.M.			
B-404	Wet Gulch	S½ sec. 14, T. 5 N., R. 12 E., M.D.M., 2 mi. SE of Jesus Maria in Wet Gulch	T. P. Shufelton, 418 Turk St., San Francisco (1936)	A N-striking vein in granodiorite with some schist.	Extensively worked years ago. Developed by N-trending adit and shaft. Ore treated in stamp mill.
B-405	Wheelock	NE¼ sec. 23, T. 4 N., R. 13 E., M.D.M., 1 mi. S Cave City by O'Neil's Creek	E. A. Thomas, Mountain Ranch	A 1- to 6-ft. vein in mica schist with talc strikes N and dips 80° E; sulfides abundant.	Active 1860s and during 1920s and 1930s; intermittently prospected. Has total output of $300,000. Developed by 1000-ft. S drift adit and several shorter ones. Ore treated in 10-stamp mill. (Crawford 96:123; Tucker 16:112.)
	Whiskey	T. 6 N., R. 13 E., M.D.M., 3 mi. SW of West Point	J. H. Thompson, West Point (1936)	Vein in granodiorite strikes N.	Active 1883. Developed by 75- and 106-ft. shafts. (Logan 36: 294.)
B-406	White Pine	NW¼ sec. 9, T. 3 N., R. 14 E., M.D.M., 1 mi. E of Murphys	A. M. McQuig, c/o Geo. Stannard, 5548 Holway St., Oakland (1936)	Vein in quartz-mica schist strikes NW.	Long idle.
B-407	White Swan	SW¼ sec. 15, T. 5 N., R. 11 E., M.D.M., 3 mi. SW of Mokelumne Hill	Annie M. Raggio, Angels Camp (1936)		North extension of Gwin mine, which see. (Kerr 00.)
B-408	Whittle	W½ sec. 14, T. 2 N., R. 13 E., M.D.M.	Henry Whittle et al., Angels Camp		(MSP 8/3/89:93; Crawford 94: 99; 96:123; Tucker 16:113; herein.)
	Wickham and Buhlert	Sec. 1, T. 6 N., R. 13 E., M.D.M., 2 mi. E West Point	Charles Gillich et al., 555 Coventry Road, Berkeley; leased to Glendon Lowry, West Point	Three N-striking veins in granodiorite.	Active many years ago; now being prospected. Developed by 350-ft. adit.
	Wide Awake	T. 5 N., R. 13 E., M.D.M., on ridge S of Esperanza Creek, 5 mi. SW of Railroad Flat	Not determined	Vein strikes W and dips N; mica schist country rock.	Active prior to 1914. Developed by 100-ft. shaft. Ore treated in 5-stamp mill. (Tucker 16:113.)
B-409	Wide West	E½ sec. 2, T. 6 N., R. 13 E., M.D.M., 1 mi. E of West Point	Richard Harker, 701 Dona St., Sunnyvale	A 2½-ft. vein in granodiorite strikes N and contains abundant sulfides. Developed by shallow shafts, several W-crosscut adits, and open cuts.	Active 1880s, 1890s. Some prospecting early 1920s. (MSP 7/19/84:40; Kerr 00; Logan 25: 151-52.)
	Widow				See Etna King.

LODE GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
B-410	Wilbur Womble.	NW¼ sec. 29, T. 2 N., R. 12 E., M.D.M.	Joseph Bertatta et al., Douglas Flat	.....	(MSP 11/21/96:426; Tucker 14: 113; Logan 25:153-154; 36: 261; herein.)
B-411	Wild Goose.....	Sec. 23, T. 3 N., R. 10 E., M.D.M.			
	Wilferd Due.....	Sec. 7, T. 4 N., R. 13 E., M.D.M., 2 mi. SW of Mountain Ranch	Not determined.....	Two 8-ft. veins at limestone-slate contact strike NW and dip NE.	Active early 1900s. Worked through 125-ft. adit. Ore treated in mill. (Kerr 00.)
	Willard.....	.....	.....	.....	See Oro y Plata.
	Wilson.....	.....	.....	.....	See Annapolis.
	Winchester.....	Sec. 21, T. 4 N., R. 13 E., M.D.M., 1 mi. NW of Fricot School	Not determined.....	Two veins up to 10 ft. thick in slate and mica schist strike NW and dip NE; galena abundant.	Long idle. Worked through 25-ft. adit and shallow shaft. (Kerr 00.)
B-412	Wolverine.....	NE¼ sec. 21, T. 6 N., R. 13 E., M.D.M.	Ruby Taylor, et al., Railroad Flat	.....	(MSP 3/25/71:178; 6/23/73: 402; Kerr 00; Tucker 16:114; Logan 36:294; herein.)
	Wonder.....	Sec. 18, T. 4 N., R. 13 E., M.D.M., 3 mi. E of Jesus Maria	Not determined.....	Two veins up to 10 ft. thick in slate strike NW and dip NE.	Long idle. Worked through 45-ft. shaft and open cut. (Kerr 00.)
B-413	Woodhouse.....	SW¼ sec. 8 and NW¼ sec. 17, T. 6 N., R. 13 E., M.D.M.	Woodhouse Mining Co., c/o W. W. Gibson, 1015 Fruitvale Ave., Oakland 1	.....	(MSP 8/7/75:84; Kerr 00; Tucker 16:114; Logan 23a:21; 24: 76; 36:294-95; Eric 48:223; herein.)
B-414	Yanix.....	Sec. 32, T. 7 N., R. 13 E., M.D.M.			
B-415	Yellow Aster (Yellow Star)	SW¼ sec. 5, T. 6 N., R. 13 E., M.D.M.	O. C. Brink and E. J. Nuhn, P.O. Box 1021, Stockton	.....	(MSP 11/26/98:533; herein.)
	Yellow Pine.....	Sec. 6, T. 2 N., R. 11 E., M.D.M., 3 mi. NE of Milton	Not determined.....	Vein in greenstone strikes N.	Active prior to 1895. (Crawford 96:123; Kerr 00.)
	Yellow Star.....	.....	.....	.....	See Yellow Aster.
B-416	Yellowstone.....	W½ sec. 30, T. 3 N., R. 13 E., M.D.M., 2 mi. NW of Angels Camp and just N of Safe Deposit mine	Ada Amerman, c/o Miss Ida H. Nape, First National Bank, Scranton, Pa.	On Mother Lode. Vein in slate and phyllite; tellurides recovered.	Active prior to 1892; recent surface prospecting. Developed by several shallow shafts. (Preston 93:173; Crawford 94:100; 96:123.)
B-417	Young America..	NE¼ sec. 14, T. 3 N., R. 14 E., 2½ mi. NW of Murphys	James C. Haslam, 1917 Bell St., Sacramento 21	Vein in mica schist strikes W.	Long idle. Developed by adit. (Crawford 96:123; Kerr 00.)
	Zacatera.....	.....	.....	.....	See North Star.
	Ziegler.....	.....	.....	.....	See Etna King. (MSP 4/10/97: 306; Kerr 00.)

PLACER GOLD

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Aetna Cons. (Peirano shaft)	E½ sec. 28, T. 3 N., R. 13 E., M.D.M., 1 mi. N of Angels Camp	.....	On Central Hill channel....	Drift-mine shaft, 240 ft. deep, 900 ft. SE of Reiner shaft; acquired by Calaveras Central Gold Mining Co., which see, in 1931; used as safety exit for workings of Reiner (main) shaft. No recorded production. (Julihn 38:42-46.)
C-1	Agostini.....	SE¼ sec. 2, T. 4 N., R. 11 E., M.D.M., near Latimer Gulch, 1½ mi. NW of San Andreas	Not determined.....	On Deep Blue Lead.....	Drift mine. Active 1890s. Shaft 200-ft. deep; short drift at bottom N. 70° E. (Preston 93:177; Crawford 96:97; Lindgren 11: 209.)
C-2	Altaville.....	NW¼ sec. 21, T. 3 N., R. 13 E., M.D.M.	Altaville Mining Co., Altaville, Lessee: George Schnauder, Box 41, Altaville	.....	(Herein.)
	Amazon Star Cons.	NW¼ sec. 21, T. 3 N., R. 13 E., M.D.M., about 1 mile N of Altaville	Purinton Mining Co., 1538 Hudson St., Redwood City	On Central Hill channel.....	Drift mine; 35-ft. shaft in red gravel; breast 60 ft. wide. (Kerr, 1900.)
	American Dredging Co.	.....	Not determined.....	.....	Successor in interest in Camanche area to Oro Water, Light and Power Co., which see.
	Atlas Gold Dredging Corp.	.....	Not determined.....	.....	(Logan 36:326; Julihn 38:88-89; herein.)
	Avalanche.....	SE¼ sec. 21, T. 3 N., R. 14 E., M.D.M., 2 mi. NE of Vallecito	John C. Cox, c/o L. V. Ruelle, Willits	On Cataract (Table Mountain) channel. Gritty channel gravel 60 ft. thick.	Drift and hydraulic mine. Drifted prior to 1900; about 1500 yds. washed in 1900s. Workings consisted of 40-ft. vertical shaft, 100-ft. tunnel. (Kerr, 1900; Tucker 15:114; Records, Calif. Debris Comm.)
C-3	Bacon, E. A....	SE¼ sec. 15, T. 4 N., R. 9 E., M.D.M., ¼ mi. NE of Wallace	Not determined.....	Gravel 5 to 40 ft. thick, contains 10% boulders, 20% clay.	Hydraulic mine. Dump trucks and stationary washing plant used by a Mr. Clark prior to 1932; 4½ million yds. gravel washed. Dredged by dragline late 1930s. E. A. Bacon washed 10,000 yds. gravel early 1940s, recovered 286 oz. gold, 14 oz. silver. Gravel mined 1941 by bulldozer, stationary washing plant. (Averill 46:251, Records, Calif. Debris Comm.)
C-4	Balaklava (I.X.L.)	SE¼ sec. 32, T. 3 N., R. 14 E., M.D.M., 1½ mi. SE of Vallecito	G. C. Tryon Estate, c/o George M. Tryon, Angels Camp	On Cataract channel. 30-ft. paystreak in soft gravel yielded $3 per carload.	Hydraulic and drift mine. SE pit hydraulicked prior to 1896. "Moyle" mine drifted 1896-1900; then NW pit hydraulicked just above drift workings. Drifting showed ground rich but faulted; workings include 400-ft. inclined (27°) shaft, 100-ft. drift to SW at 375-ft. level. (Lindgren 11:201; Logan 36: 326-27; Tony Sturla, personal communication: 1957.)
	Baldwin.....	.....	.....	.....	See Calaveras Hill Cons.
C-5	Banner Blue Gravel (Big Bend)	Center sec. 24, T. 5 N., R. 13 E., M.D.M., 4 mi. NE of Mountain Ranch, at intersection of Jesus Maria Creek and Fort Mountain channel	Not determined.....	Gravel 15 ft. thick, 100 ft. wide; contains 25%-40% coarse boulders, much black sand and pyrite. Gravel capped by rhyolite, said to average $2.50 to $4.00 per ton.	Drift mine. Worked in 1890s and 1900s. Workings consisted of two tunnels, 360 and 380 ft. long, drifts, two shafts to bedrock at 62 and 68 ft., and an 8-stamp mill. (MSP, 9/14/95: 168; 9/28/95:202; Lindgren 11:211; Tucker 15:114.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or gorup	Location	Owner (Name, address)	Geology	Remarks and references
	Barker	SE¼ sec. 11, T. 4 N., R. 11 E., M.D.M., immediately west of Union Shaft drift mine	Sterling Carter, Murphys	On Central Hill channel	Drift mine. See also Union drift mine.
	Barn				See Corral Flat.
C-6	Barnhardt	SE¼ sec. 25, T. 4 N., R. 12 E., M.D.M., 1 mi. NE of Calaveritas	Calaveras Cement Co., 315 Montgomery St., San Francisco		Hydraulic mine. Active 1897-1901, when about 17,000 yds. gravel washed by Messrs. Peirano and Cadematori. (Records, Calif. Debris Comm.)
	Big Bend				See Banner Blue Gravel.
C-7	Blue Gravel	NE¼ sec. 2, T. 4 N., R. 11 E., M.D.M., 3½ mi. NW of San Andreas, between Latimer and Chili Gulches	Not determined	On Deep Blue Lead. Blue gravel on slate bedrock capped by volcanic tuff. Tertiary stream crossing over flat bedrock here has cut several channels.	Drift mine. Active prior to 1900, intermittently in 1930s. Development consists of 115-ft. vertical shaft, 500 ft. of drifts W and NW, and N-trending crosscut. Older caved workings included 75-ft. tunnel and breast 100 ft. wide. (Kerr 00; Logan 36:327; Julihn 38:66.)
C-8	Boire	NE¼ sec. 26, T. 6 N., R. 13 E., M.D.M., ½ mi. E of Railroad Flat	Not determined	On Fort Mountain channel. Gravel 60 ft. thick capped by rhyolite tuff, rests on soft mica schist bedrock. Gravel loose, occasionally semi-cemented; contains few boulders. Black sand abundant. Gold very fine, averaged $1.50 per yd.	Drift mine. Active prior to 1900; Walter Boire washed 1500 yds. gravel 1900; worked intermittently by different individuals until 1938. Workings include 200-ft. inclined shaft, 400-ft. N-trending drift, bedrock tunnels, extensive breasting. Cox pan and sluices handled 120 tons per day in 1915; a concrete mixer, screen, sluice with Hungarian riffles, and ½-ton skip were used in 1936. (Kerr 00; MSP 5/18/12:707; Tucker 15:114; Logan and Franke 36:327-328; Julihn and Horton 38:73; Records, Calif. Debris Comm.; Ruby Taylor, personal communication: 1957.)
	Bonanza				See Purinton Mining Co.
	Boucher and Brackett	SW¼ sec. 18, T. 5 N., R. 12 E., M.D.M., 2 mi. S of Mokelumne Hill, adjacent to Veith mine	Percy S. Peek, et al., Mokelumne Hill	On Tunnel Ridge channel	Drift mine. Active 1868, when 5-stamp mill was erected, tunnel driven from rim to rim; 1000 ft. of channel worked by 1873; new tunnel higher up ridge driven 600 ft. to channel in 1873. Active again 1881. Considered part of Green Mountain drift mine (which see) by Tucker, Averill. 50 oz. gold said to have been recovered during two weeks, 1872. (MSP 5/9/58:304; 1/27/72:52; 1/25/73:52; 11/8/73:292; Tucker 15:118; Averill 43:315-16.)
C-9	Boundary Cone	NW¼ sec. 19, T. 5 N., R. 12 E., M.D.M., 3½ mi. S of Mokelumne Hill	Not determined	On Deep Blue Lead. Channel trends SW. Gravel well-rounded, small (60% minus ½-in.) semi-cemented, contains some blue clay. Bedrock is black schist, quartzite. Paystreak 8 to 15 ft. thick, 100 to 200 ft. wide, averaged $1.00 to $1.50 per yd. Gold 900 fine.	Drift mine. Active 1927-28, 1932-37. Development consists of N-trending, 390-ft. inclined shaft to bedrock, 1700-ft. timbered haulage-drift upstream, 650-ft. NE-trending drift. Breasting on both sides of haulage drift. Washing plan consisted of 3- by 11-ft. scrubber-trommel, 50 ft. of sluices. (Logan 36:328; Julihn 38:63-64.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and reference
C-10	Bowling Green	NE¼ sec. 30 and SE¼ sec. 19, T. 3 N., R. 14 E., M.D.M., ½ mi. NNE of Vallecito	Tony and Violet Sturla, Vallecito	On Central Hill channel. Pay streaks contained fine dust, some nuggets, in hard, post-volcanic gravel. Cobbles common.	Drift mine. Shaft sunk and some drifting in 1920s. Dragline dredge operated by San Andreas Gold Dredging Co., which see, 1939-40. Gravel used by County for aggregate in 1940s, 1950s. (Tony Sturla, personal communication, 1957.)
C-11	Brassila	W½ sec. 6, T. 4 N., R. 14 E., M.D.M., 1½ mi. NW of Sheep-ranch	Not determined	On Fort Mountain channel. Cemented gravel.	Drift mine. Gravel crushed, amalgamated in 10-stamp mill. (Lindgren, 11:211.)
C-12	Buck Bros. (Chapman, Plug Ugly)	SE¼ sec. 21, T. 4 N., R. 12 E., M.D.M., 2 mi. SE of San Andreas, adjacent to Chris Anderson mine	Not determined	On Central Hill channel. Channel trends N. 40° W. Downstream from main shaft, channel narrow, has steep grade. Further downstream, good pay gravel reported where grade flattens. Pay gravel 20 to 40 ft. wide, 6 ft. thick, contains 50% large boulders, is capped by 170 ft. of volcanic ash. Gold medium-coarse, 885 fine.	Drift mine. Active mid-1930s. Development includes 200-ft. inclined (78°) shaft, drifts 700 ft. downstream and 120 ft. upstream. Mill consisted of bin, trommel, sluices. (Tucker 15: 115-16; Julihn 38:71-71.)
	Buckminster				See Ohio.
C-13	Buffalo	SE¼ sec. 23, T. 5 N., R. 11 E., M.D.M., 2 mi. SW of Mokelumne Hill just S of What Cheer mine	Mildred S. Barker et al., c/o First Western Bank & Trust Co., Oakdale	On Deep Blue Lead. Channel trends S, is 120 ft wide; 6-ft. thickness of gravel averaged $2.20 per yd. 1917, contained black sand with minor osmium, platinum. Soft slate bedrock; lava cap 100 ft. thick.	Drift mine. Worked prior to 1901; unwatered and 200-ft. shaft, 900 ft. of drifts run 1902; idle 1903-16. Idle since 1918 except dewatering and development 1934-35. Workings include 4200 ft. of drifts, crosscuts. Used 50 tons per day 3-stamp mill 1902. Mill test 1917 used 3-stamp mill, screens, riffles, Neil jig, Deister table. (MSP, 2/23/01:107; 4/19/02:222; 11/10/17:700; Tucker 15:115; Logan 36:329; Julihn 38:66-68.)
C-14	Bully Boy	SW¼ sec. 8 and N½ sec. 17, T. 3 N., R. 13 E., M.D.M., just S of Dogtown	Narcisco F. and Grace L. Ponte, San Andreas		25 men worked 70-ft. bank hydraulic mine prior to 1900, 120-ft. shaft in early 1900s. (Kerr 00; MSP, 7/11/03:27.)
	Bunker Hill	S½ sec. 27, T. 3 N., R. 10 E., M.D.M., 1½ mi. S of Jenny Lind	Not determined		Hydraulic mine. Active prior to and during 1872. (MSP 3/23/72:180; Turner 15:120.)
	Burleson				See Concentrator.
C-15	Calaveras Central	Portions of secs. 21, 22, 23, 26, 27, and 28, T. 3 N., R. 13 E., M.D.M., main shaft in NE¼ sec. 28; 1 mi. N of Angels Camp	Calaveras Central Gold Mining Co., Ltd., c/o Harry Sears, Trustee, Angels Camp		See also Aetna, McElroy, Slab Ranch, and Victor mines. (Minerals Yearbook 35:171-173; Logan 36:329-330; Minerals Yearbook 37:284-286; Julihn 38:42-58; Minerals Yearbook 40:230-231; Averill 46:235-247; herein.)
	Calaveras Crystal				See Green Mountain.
	Calaveras Gold Dredging Co.	On Calaveras River near Jenny Lind	Not determined	Depth of gravel about 20 ft. Gravel coarse, loose; overlain by clay, loam, hydraulic tailings; rests on soft clay bedrock.	Bucket-line dredge. Intermittently active 1904 to at least 1915. Calaveras Dredge No. 1 carried 78 5-cu.-ft. buckets. Other land owned by this company leased to Atlas Gold Dredging Corp. (which see) in 1935. (Minerals Yearbook 05:174-5; 07:206; Aubury 10:207-08; Tucker 15: 124-25.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-15	Calaveras Hill Cons. (Baldwin, Calaveritas Hill)	SE¼ sec. 35, T. 4 N., R. 12 E., M.D.M., ½ mi. S of Calaveritas	Harriett B. G. Kramer, c/o S & A X-Ray Laboratory, 1706 Broadway, Oakland	On Central Hill channel. Gravel bank 75 ft. high, 600 ft. long; estimated reserves 4 million cu. yds. averaging 30 cents per yd. Tight, fine gravel free of large boulders rests on soft slate bedrock; lenses of tuff cap gravel, are interbedded with it.	Hydraulic mine. Operated 1901 and again 1906, when 1000 yds. gravel washed; 13,000 yds. washed Jan.-Mar. 1910. East Fork Mines, Inc. operated property May 1936–May 1939; 29,100 yds. washed, but damaged water lines prevented full activity. Equipment consisted of two giants and 500 ft. of sluice and tailrace. (MSP 4/11/03:235; Tucker 15:115; Logan 36:332-333; Julihn 38:93-94; Records, Calif. Debris Comm.)
	Calaveras Holding Trustees, Ltd.	Sec. 8, T. 4 N., R. 10 E., M.D.M., 2½ mi. E of Camanche	Not determined.....	Gravel 10 to 20 ft. deep overlies clayey lava bedrock; said to test about 25 cents per cu. yd.	Hydraulic mine. Active 1933-35. About 8900 yds. gravel hydraulicked 1934, but late in 1935 moved by power shovel and trucks to Huelsdonk concentrator and sluices. (Logan 36:331; Records, Calif. Debris Comm.)
	Calaveras Hydraulic Mining and Water Co.	About 6½ mi. N of Milton	Not determined.....	.....	Hydraulic mine. Worked in 1870s and 1880s. 10-ft. blue gravel on bedrock worked by two 6-inch giants; $1200 recovery from 6-day run reported. (MSP 4/27/72:260; 6/29/72:404; Irelan 88:148-49.)
	Calaveritas Hill..	.....	.....	.....	See Calaveras Hill Cons.
	Calmo.....	.....	.....	.....	See Slab Ranch.
	Camanche Gravel Mining Co.	NE¼ sec. 10, T. 4 N., R. 9 E., M.D.M.	.....	Auriferous gravel 22 ft. thick.	Gravel at junction of Mokelumne River and Camanche Creek worked intermittently by hand, suction, dredge, and shallow shaft, 1878-99. (MSP 6/1/78:340; 8/5/99:151.)
	Camanche Placers, Ltd.	NE¼ sec. 12, T. 4 N., R. 9 E., M.D.M., 1 mi. NE of Camanche	.....	Six- to 10-ft. tight pay gravel on Valley Springs rhyolite clays covered by eroded remnants of sand and clay that are stripped prior to dredging. Gold 850 fine, and of fine size. Pay gravel said to average 25 to 50 cents per yd.	Small connected-bucket dredge worked just N of Camanche, Sept. 1935 to May 1938. (Logan 36:333; Minerals Yearbook 1936:226; Julihn 38:77-79; Minerals Yearbook 39:253.)
	Canepa.....	.....	.....	.....	See Golden Queen.
	Cassinelli.....	.....	.....	.....	See Rising Star.
C-17	Cat Camp Placers.	SW¼ sec. 14, T. 4 N., R. 9 E., M.D.M., 1 mi. E of Camanche	Not determined.....	.....	Operated non-floating washing plant 1 mi. E of Camanche 1941-42. About 172,000 cu. yds. gravel yielded 1,188 oz. gold, 66 oz. silver. (Minerals Yearbook 41:245; 42:284.)
C-18	Central Hill.....	SW¼ sec. 8, T. 3 N., R. 14 E., M.D.M., 1 mi. S of Murphys, upstream from Uptograph mine	William Thomas Jr., Box 108, Mariposa	On Central Hill channel. Channel deep and narrow, with subangular gravel capped by volcanic rock. Hydraulicking at N end of claim in 1894 revealed transverse, rhyolite-filled channel that cut off main channel. Pay gravel 30 to 100 ft. wide, 5 ft. deep.	Drift and hydraulic mine. First worked in 1850s as hydraulic mine; active intermittently 1888-97. Drain tunnel 3300 ft. long run from Douglas Flat 1892-94, after which hydraulicking began again. 14,400 yds. gravel washed by Wm. Thomas and others 1895-1900; $14,600 yield during 1896. (MSP 2/4/88:67; Crawford

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-18	Central Hill—Continued				94:91; 96:100; MSP 4/25/96:342; 12/5/96:459; Lindgren 11:201; Tucker 15:115; Records, Calif. Debris Comm.)
C-19	Central Hill	SE¼ sec. 11, SW¼ sec. 12, NW¼ sec. 13, T. 4 N., R. 11 E., M.D.M., S of Union Shaft drift mine; E of Latimer Gulch, 2½ mi. NW of San Andreas	Lottie Jackson, San Andreas (C. W. Neilsen, San Andreas: gravel rights in ravine.)	On Central Hill channel. Semicemented gravel interbedded with sand layers; 50 to 75 ft. wide, 20 ft. thick. Boulders numerous, commonly encrusted with pyrite that cements sand, entraps gold. Gravel rests on slate bedrock, is capped by 135 ft. of volcanic ash. Channel tilted by faulting: bedrock slopes S, but downstream is N. Medium-coarse gold recovered chiefly from top 3 ft. of bedrock, lower 3 ft. of gravel. Pay gravel yielded $2 to $3 in gold that was 810-850 fine, contained 145-170 parts silver.	Drift mine. Active middle to late 1930s. Workings include 370-ft., 30°-inclined shaft trending N. 70° E.; 1,000-ft. drift downstream from incline station encountered drifts of old Union Shaft mine. Small amount of gravel breasted hand-sorted, washed in 2½- by 8-ft. scrubber trommel, 48 ft. of sluices. (Logan 36:335; Julihn 38:60-61.)
	Chapman				See Buck Bros.
	Chappellet (El Encino)	N½ sec. 35, T. 5 N., R. 11 E., M.D.M., 4 mi. S of Mokelumne Hill	Not determined	On Chili Gulch channel. Cemented gravel contains rhyolite fragments, is overlain by rhyolite tuff.	Drift mine in Chili Gulch. Active prior to 1893; 1,100-ft. bedrock drainage tunnel driven in 1895, and 10-stamp mill in use. Drag-line scraper used to work old tailings 1924; tractor-drawn scraper, trommel, and sluices used 1936. Development includes 5 air shafts, caved drifts. (Crawford 94:91; MSP 10/26/95:270; Crawford 96:103; Lindgren 11:209; Logan 25:161; Logan 36:339.)
C-20	Chatfield	E½ sec. 23, T. 5 N., R. 11 E., M.D.M., 2 mi. SW of Mokelumne Hill	Union Mines, Inc.	On the Concentrator channel. Large dump contains fragments of black slate bedrock, and pebbles of schist, andesite, and quartz.	Drift mine. Active 1930s. Vertical shaft about 60 ft. deep. Gravel washed in 4½- by 15-ft. scrubber-trommel and short sluice box.
C-21	Chili Gulch	SE¼ sec. 13, T. 5 N., R. 11 E., M.D.M., 1¼ mi. S of Mokelumne Hill, near State Hwy. 49	R. P. M. Davis, 666 Rudd St., Vista	On Chili Gulch channel.	Drift mine. Active intermittently 1937-Oct. 1942. North shaft was sunk first, abandoned because of excess water. Shaft 200 ft. S is 140 ft. deep. Drifting to E encountered old workings from N shaft; most drifting was SE of shaft. (Personal communication, Mrs. Mervin Porteous, Mokelumne Hill.)
	Chispa	Sec. 30, T. 4 N., R. 14 E., M.D.M., 2 mi. N of Murphys, on ridge between San Domingo and Indian Creeks	Not determined		Drift mine. Active prior to 1915. Shaft to bedrock 95 ft. deep; 2 rimrock tunnels 50 and 100 ft. long. (Tucker 15:116.)
C-22	Chris Anderson (Square Head)	SE¼ sec. 21, T. 4 N., R. 12 E., M.D.M., 1½ mi. SE of San Andreas	John R. Rathgeb, Box 44, San Andreas	On Central Hill channel. Channel 280 ft. wide, gravel 63 ft. deep; pay gravel 150 ft. wide, 7 ft. deep. Said to have yielded 10,000 oz. gold prior to 1906.	Drift mine. Active 1904, when 100-ft. vertical shaft, 450-ft. bedrock tunnel driven to gravel; drifts driven 500 ft. upstream; sold 1906 for $570 judgment. In 1935-37, old shaft and some workings reconditioned, small amount gold recovered. (MSP 3/5/04:169; 3/10/06:168; Tucker 15:122; Logan 36:352; Julihn 38:72-73.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Church Union.... (Kraemer)	Sec. 26, T. 5 N., R. 11 E., M.D.M., 3 mi. S of Mokelumne Hill	Not determined.....	On Kraemer channel.....	Drift mine. First active as Kraemer 1876; 1,400-ft. tunnel driven in 1884. Some activity 1899. In 1946, 20 acres virgin ground said to contain 1 oz. per yd. for 6-ft. cut on bedrock. (MSP 12/6/84 : 360; 12/23/99 : 723; Averill 46:252.)
C-23	Clark.....	SE¼ sec. 26, T. 6 N., R. 13 E., M.D.M., SE of Railroad Flat	Thomas Taylor, Railroad Flat	.....	Hydraulic mine. Active prior to 1869. Bedrock sluice tunnel driven 800 ft., 1872; 7 monitors operating, 1873; closed down, 1875; active again, 1881. Portion patented 1893 as (Edwin) Taylor placer mine; 32,350 yds. gravel washed under Debris Commission license issued Jan. 1899. Inactive since. Pit several hundred feet wide, 6 to 12 ft. deep to bedrock. (MSP 9/4/69:150; 7/27/72:52; 12/6/73:356; 4/30/81:276; Records, Calif. Debris Comm.)
	Cleveland.....	SW¼ sec. 32, T. 5 N., R. 13 E., M.D.M., 2 mi. N of Mountain Ranch, adjacent to Foley claim	Ila G. Zwinge, Box 277, Altaville	On El Dorado channel.....	Drift mine. Operated by Philip Foley prior to 1900. (Kerr 00.)
	Clover Leaf.....	SE¼ sec. 12, T. 5 N., R. 11 E., M.D.M., on W slope Stockton Hill	Not determined.....	On Chili Gulch Deep Blue Lead. Bedrock at 420-ft. depth; blue cemented gravel mined by 100-ft. breasts.	Drift mine. By 1900 workings, including 15 shafts, totaled 4,700 ft. Worked through 1,800-ft. tunnel in 1915. (Kerr 00; Tucker 15:116.)
C-24	Coffee Mill..... (Gleason, Golden Gate)	NW¼ sec. 35, T. 5 N., R. 11 E., M.D.M..	Eunice N. Van Winkle and Edmund J. Stocker, 2631 Robbindale, Stockton	.....	(MSP 2/1/68:70; 2/15/68:102; 12/26/68:406; 9/4/69:150; 10/30/69:278; 6/29/82:412; 10/22/92:277; 12/9/94:362; many others; Crawford 96:101; Tucker 15:116; herein.)
	Comanche dredges.....	.....	.....	.....	See Gold Hill Dredging Co.
	Comanche Gold Dredging Co...	.....	.....	.....	Began dredging Sept. 1935 near bridge ½ mi. NW of Camanche, moved downstream; connected-bucket dredge handled 500,000 yds. gravel 1935, was active until 1939, when company was consolidated with Gold Hill Dredging Company, which see. (Logan 36:226; 39:232; H. S. Gilbert, personal communication, 1953.)
	Concentrator (Burleson)	SE¼ sec. 13, T. 5 N., R. 11 E., M.D.M., 1 mi. S of Mokelumne Hill, in Chili Gulch	Not determined.....	Lower channel 200 ft. wide contains "blue gravel", has pay gravel 5½ ft. thick; upper (Duryea) channel 90 ft. above lower, is 100 ft. wide, contains 12 to 15 ft. of pay gravel capped by rhyolite and andesite tuffs.	Drift mine. In 1887, old tunnel reopened for 1000 ft., 10-stamp mill built, and new tunnel advanced 500 ft. in upper channel. (MSP 3/19/87:192; Lindgren 11:208.)
	Corral Flat (Barn).	SE¼ sec. 7, T. 5 N., R. 12 E., M.D.M., ½ mi. S of Mokelumne Hill	Not determined.....	On Corral Flat channel. Channel trends SW, contains gravel 40 ft. wide, 12 ft. deep. Some gravel cemented; contains many boulders; said to average $1.50 per yd.; coarse,	Drift mine. Active 1870-71, 1880-82, mid-1910s, 1936. Old workings include 2000-ft. tunnel driven in rhyolite from NW slope Stockton Ridge, several winzes sunk 60 ft. to bedrock; 1936 workings in-

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-24	Corral Flat (Barn) —Continued			925-fine gold in bottom 3 ft. and on bedrock.	clude 160-ft. vertical shaft, 40-ft. crosscut, 100-ft. drift. Washing plant consisted of trommel and sluices. (MSP 11/29/70: 364; 6/7/13:873; Tucker 15: 116; Logan 36:327; Julihn 38:71.)
C-25	Cuneo Bartholomew	W1/4 sec. 10, T. 4 N., R. 13 E., M.D.M., 1 mi. SE of Mountain Ranch	George and Frieda Kenefick, Route 1, Box 287, Galt	On El Dorado channel. Steep-sided channel, with maximum 25 ft. auriferous gravel capped by 10 ft. of clay, rhyolite ash, gravel, and soil. Gravel chiefly subangular schist, with some quartzite and minor quartz. SW pit, now water-filled, once showed bedrock cut by another channel, 15 ft. deep and 200 ft. wide, containing 5 ft. subangular quartzite gravel.	Hydraulic pits. Active prior to 1911; dragline dredge active 1930s. Floating washing plant of 1930s used 4- by 12-ft. trommel, 40-ft. stacker, about 60 ft. of sluices. (Lindgren 11: 211; Tucker 15:118; David Zwinge, personal communication, 1957.)
	Davis Ranch.....	Sec. 3, T. 5 N., R. 13 E., M.D.M., 2 mi. S of Railroad Flat	Not determined.....	On Fort Mountain channel. 60 ft. rhyolite, 10 ft. loose slate and blue gravel.	Drift mine. 70-ft. vertical shaft sunk 1936. (Logan 36:337.)
	Deep Lead.....	NE1/4 sec. 13, T. 5 N., R. 11 E., M.D.M., 1/2 mi. S of Mokelumne Hill	R. B. Westwood, Natoma	On Deep Blue Lead. Channel trends S, is 40-60 ft. wide; cemented gravel averaged $1.00 per carload.	Drift mine. Active 1880s. Old workings include 380-ft. inclined tunnel, 2600 ft. of drifts along channel, and 800 ft. of crosscuts. (Kerr 00; Irelan 87: 29; Averill 46:252.)
C-26	Duck Bar.....	E1/2 sec. 27, T. 3 N., R. 14 E., M.D.M., 3 mi. E of Vallecito, on Stanislaus River	M. H. and Laura Manuel, Murphys	.....	Placer mine. Bar gravel worked 1914 by turning course of river; use of suction dredge planned 1936. Most gold in pot holes in limestone bedrock. (Tucker 15:116; Logan 36:338.)
C-27	Duryea (Shaw)...	NE1/4 sec. 24, T. 5 N., R. 11 E., M.D.M.	Not determined.....	.....	(MSP 2/10/66:86; 9/21/72: 176; 1/25/73:52; 7/8/76: 29; 8/25/88:128; Irelan 88: 148; MSP 4/29/11:606; Lindgren 11:210; Tucker 15: 117; herein.)
C-28	E & B.....	NW1/4 sec. 10, T. 4 N., R. 10 E., M.D.M., 1 mi. SW of Campo Seco	Not determined.....	Gravel said to be delta deposit of Tertiary Calaveras River. Five to 20 ft. kaolinized gravel on decomposed slate bedrock, is capped by 2 to 5 ft. cemented angular quartz conglomerate and thin layer of quartz gravel. Flour gold, 875 fine, in gravel, conglomerate, and on bedrock. Auriferous pyrite in conglomerate.	Placer mine. Gravel tested for gold recovery by jigging and flotation 1936-37. Gravel treated by jaw crusher, ball mill, jig, table, classifier, and flotation cells. (Julihn 38:90-92.)
	Eastland–Gray Development Co.	Sec. 31, T. 5 N., R. 12 E., M.D.M., 3 mi. N of San Andreas, on North Fork Calaveras River	Not determined.....	.....	Hydraulic mine. Worked 1905-12, during which time $80,000 is said to have been recovered. Prospected 1914. Sluiced gravel moved by hoist from limestone crevices to revolving screen. (Tucker 15:117.)
C-29	Eclipse.....	SE1/4 sec. 24 and NE1/4 sec. 25, T. 5 N., R. 11 E., M.D.M., 2 1/4 mi. S of Mokelumne Hill, in Old Woman Gulch	John J. Fillerup, San Andreas	On Tunnel Ridge channel. Channel trends SW, has 200-ft. mineable width, contains uncemented quartz gravel with boulders and much clay; overlain by cemented conglomerate and	Drift mine. Active intermittently 1895-1914, 1934-37, 1950, 1957-58; 1000 yds. gravel from pockets of unworked gravel in old workings and some virgin ground said to have yielded $6000, 1937. Pros-

PLACER GOLD—Continued

Map No.	Name of claim, mine, or gorup	Location	Owner (Name, address)	Geology	Remarks and references
C-29	Eclipse—Continued			basalt flow. Gold coarse, flat, rusty, 920 to 940 fine; concentrated mainly on soft slate bedrock, but also in conglomerate. Virgin ground said to average $3 to $6 per yd.	pecting and development 1957-58. Workings of 1930s include adit trending 250 ft. W and 150 ft. SW, crosscuts 125 ft. N, 25 ft. S. Old workings encountered at S end of property. Gravel treated by scrubber-trommel, 36 ft. of sluices. (Crawford 96:109; Tucker 15:117; Logan 36:338-39; Julihn 38:69-70; John Fillerup, personal communication, 1957.)
C-30	Eho	NE¼ sec. 14, T. 3 N., R. 14 E., M.D.M., 3 mi. E of Douglas Flat	Not determined	Gravels chiefly metamorphic rock; thought to represent main channel Tertiary Calaveras River, or less productive Cataract channel.	Hydraulic pits, active 1870s, 1890s, early 1900s. West pit 40 ft. deep, 75 ft. across; east pit 75 ft. deep, 150 ft. across. (MSP 1/31/91:68; Lindgren 11:200-01; Tony Sturla, personal communication, 1957.)
	El Encino				See Chappellet.
	Ellen Vannan				See Lombardi.
C-31	Emerson	SE¼ sec. 7, T. 5 N., R. 12 E., M.D.M., 1 mi. SE of Mokelumne Hill	J. C. Harle, 987 Fifth Ave., New York 21, N. Y.	On Deep Blue Lead	Hydraulic mine. Hydraulicked prior to 1874. Two nozzles washed gravel through 600-ft. bedrock tunnel, ¾-mi. flume; $6,000 recovered 1876. Inactive 1896-1916. Prospected 1917. About 400 yds. gravel washed Oct.-Nov. 1927. (MSP 8/22/74:116; 6/3/76:357; 11/11/76:317; 6/2/17:781; Records, Calif. Debris Comm.)
	Emery				See Rose Hill.
C-32	Empire	NE¼ sec. 25, T. 5 N., R. 11 E., and SE¼ sec. 19, T. 5 N., R. 12 E., M.D.M., in Old Woman Gulch 2½ mi. S of Mokelumne Hill	J. C. Harle, 987 Fifth Ave., New York 21, N. Y.	On Deep Blue Lead	Drift mine. Active around 1952. Little gravel produced. Timbered E-trending adit 300 ft. long. (John Fillerup, personal communication 1957.)
	Fairview	SE¼ sec. 32, T. 3 N., R. 14 E., M.D.M., 1½ mi. SE of Vallecito, adjacent to Balaklava mine	Clarence H. and Lillian L. Pate	On Cataract channel	Drift mine. Active prior to 1915. Workings include shaft 100 ft. deep, 300-ft. tunnel, (Tucker 15:118.)
	Fine Gold	Sec. 32, T. 3 N., R 14 E., M.D.M., 1½ mi. SE of Vallecito	Not determined	On Cataract channel. Gravels 2 and 30 ft. thick.	Hydraulic mine. Hydraulicked at two banks 40 and 120 ft. high. About 96,000 yds. washed 1895-1901. Probably same as Balaklava pits, which see. (Kerr 00; Records, Calif. Debris Comm.)
C-33	Flume House	Center sec. 23, T. 5 N., R. 11 E., M.D.M., 1½ mi. SW of Mokelumne Hill	Not determined	On Concentrator channel. Channel 60 ft. wide, trends SE, contains 20 ft. of volcanic gravel, ash, and cobbles overlain by 300 ft. of gravel, ash, and rhyolite. Pay gravel loose, contains few rounded cobbles; black slate bedrock very irregular. Coarse, smooth gold 850 fine, is in and close to bedrock, averaged $2 to $3 per yd.	Drift mine. Active 1920s, worked unsuccessfully 1931, explored and developed 1934-36. Workings include 330-ft. vertical shaft, drifts downstream for 400 ft. Gravel washed in 16-ft. scrubber-trommel, 70 ft. of sluices. (Logan 36:339; Julihn 38:68-69.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-34	Foley	W½ sec. 32, T. 5 N., R. 13 E., M.D.M.	Virginia and Donald C. Butterfield, Mountain Ranch		See Cleveland mine.
C-35	Folsom dredge	E½ sec. 30, T. 3 N., R. 10 E., M.D.M., 2½ mi. SW of Jenny Lind	A. R. Folsom (1938)	Gravel well-rounded, 5 to 20 ft. thick, overlies light-gray tuff, contained 25 cents per yd. fine, flakey gold.	Small connected-bucket dredge operated 1936-37. Gravel loosened by 1-yd. power shovel moved by 27 buckets with 1½-cu.-ft. capacity, washed by 18-ft. trommel and 192 sq. ft. of riffles. (Julihn 38:81-82.)
	Fourth of July	SE¼ sec. 34, T. 5 N., R. 10 E., M.D.M., 1 mi. SW of Campo Seco	Not determined	Up to 7 ft. uncemented, clay-bearing gravel overlain by 60 to 80 ft. ash and gravel; false bedrock highly kaolinized. Gravel said to average $6 per yd. in coarse, 940-fine gold near and in bedrock; some platinum.	Drift mine. Active 1935-37. Workings include vertical shafts 60 to 90 ft. deep, 650 ft. of drifts. Gravel trucked 4 miles to Mokelumne River for washing in 20-ft. scrubber-trommel and 50 ft. of sluices. (Logan 36:340; Julihn 38:74-75.)
	Forty Nine	Secs. 16 and 17, T. 3 N., R. 14 E., M.D.M., at Douglas Flat, on Coyote Creek	Not determined	On Central Hill channel.	Drift mine. Active 1903-04; 185-ft. shaft to bedrock, 2,000 ft. of drifts N and S. (MSP 1/24/03: 59; Tucker 15:118.)
	Garibaldi dredge				See Mountain Gold Dredging Co.
	Gleason				See Coffee Mill.
C-36	Glenn	NE¼ sec. 31, T. 5 N., R. 13 E., M.D.M., 3 mi. NW of Mountain Ranch	Not determined	Gravel in several gulches; largest body 50 ft. wide, 6 ft. deep.	Hydraulic mine. Active 1922-25, when estimated 6,700 yds. gravel washed. (Hamilton 22: 29; Logan 23:18; Records, Calif. Debris Comm.)
	Glo-Bar	Near Campo Seco	Not determined		Drift mine. Active 1940-41. About 4,500 yds. gravel yielded 321 oz. gold, 44 oz. silver, in 1941. (Minerals Yearbook 40:242; 41:235.)
C-37	Gold Chief	E½ sec. 18, T. 6 N., R. 13 E., M.D.M., 2½ mi. NE of Railroad Flat	Albert P. Meyers, 220 Newland St., Los Angeles 42	On Fort Mountain channel. About 20 ft. of loose gravel, containing some boulders, rests on decomposed slate.	Drift mine. Active 1931-35. Gravel said to average $1.30 per ton. Worked by 525-ft., NW-trending, inclined tunnel and about 400 ft. of crosscuts and drifts. (Logan 36:340-341.)
	Golden Gate				See Coffee Mill.
C-38	Golden Queen (Canepa)	Center sec. 26, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Vallecito, near Six Mile Creek	Not determined	On Central Hill channel. Drifts were thought to bridge 250-ft.-wide depression in slate bedrock; 2 prospect winzes show maximum depth of 30 ft. Gravel carries minor amount of gold, is not main channel. Geophysical prospecting said to have indicated lower channel to the N.	Drift mine. Active Apr.-Nov. 1935, May 1936-early 1937; 116-ft. vertical shaft sunk; 45-ft. drift S struck 2-ft. pay gravel; 220-ft. drift N. Last activity was drifting S to connect with old 80-ft. incline. (Angels Camp Californian 3/15/34; Stockton Independent 4/9/35; Logan 36:343; Julihn 38:59.)
C-39	Golden River	SW¼ sec. 19, T. 3 N., R. 14 E., M.D.M.	T. E. and E. K. Stearman, Vallecito		(Averill 46:252; Logan 36:343-44; Julihn 38:58-59; herein.)
C-40	Golden Treasure	S½ sec. 7, T. 3 N., R. 13 E., M.D.M., 2 mi. N of Altaville	Not determined	On Central Hill channel.	Drift mine, just NW of Jack Rabbit, which see. Some drifting 1923. (Logan 24:7.)
	Gold Gravel Products Inc.	Secs. 13 and 15, T. 4 N., R. 9 E., M.D.M., E of Wallace	Not determined	Eight ft. of auriferous lone shoreline gravel, sand, and clay rest on soft andesite tuff; gravel tightly packed; no boulders.	Power shovel and stationary washing plant just E of Wallace 1934-35; plant handled 459,841 yds. gravel near Wallace 1934. Dragline and floating washing plant used S of Caman-

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-40	Gold Gravel Products, Inc. —Continued				che for 5 weeks, late 1935. Dragline and stationary plant used early 1936. Floating plant capacity 3,000 yds. per day; used 26-ft. scrubber-trommel, double set of sluices. Stationary plant capacity 7,000 yds. per week; 30-ft. scrubber-trommel, 300-ft. sluice box. (Minerals Yearbook 35:171; Logan 36: 341-42; Julihn 38:89.)
C-41	Gold Hill.....	SE¼ sec. 6 and NE¼ sec. 7, T. 4 N., R. 10 E., M.D.M., 1½ mi. NE of Camanche	George Knudsen, lessee, Box 156, Camanche	.....	Surface placer being prospected in mid-1958. Gold distribution is erratic. Portable washing plant consists of small trommel, sluice and Knudsen bowl.
	Gold Hill Dredging Company	.....	J. J. Coney, Pres., 311 California St., San Francisco 4	Gravel 16 to 50 ft. thick, capped by 10 ft. soil and silt; gravel medium-sized, loose with little clay; gold coarser to the east; "Upper Camanche" gold more than 850 fine; no platinum recovered.	Consolidated with Comanche Gold Dredging Co. 1939; operated 2 dredges on Mokelumne River. "Upper Camanche" dredge operated until Jan. 1949; area dredged was between Camanche and county line. Dredge handled about 150,000 yds. per month; was equipped with jigs and riffles. (H. S. Gilbert, personal communications 1953; Clark 55:37-39.)
	Gold Ribbon....	NW¼ sec. 36, T. 5 N., R. 11 E., M.D.M., 3½ mi. S of Mokelumne Hill, in Chili Gulch	Not determined.....	Exposed cemented gravel 35 ft. deep, on slate bedrock; best values within top 6 ft.; tests show $0.50 to $1.00 per yd.	Hydraulic mine. Hydraulicked 1880s and unsuccessfully in 1935. Equipment included 2-in. nozzle, 100-ft. sluice box. (Logan 36:342-43.)
C-42	Gopher.....	Portions of sec. 8, T. 5 N., R. 12 E., M.D.M., 2 mi. E of Mokelumne Hill	Ernest C. Vandell, et al., c/o Alice J. Fischer, Mokelumne Hill	On Gopher Channel. Two pits expose 3 gravels; pre-rhyolite member 15 ft. thick, consists of coarse, siliceous, cemented gravel with slate fragments; overlain by middle member; lenses of rhyolite tuff and detritus; upper member subangular, poorly sorted, post-rhyolitic gravel. Channel generally narrow, with steep rims.	Hydraulic pits. Active 1860s. (MSP 6/20/68:400; Lindgren 11:206.)
C-43 D-73	Green Mountain. (Calaveras Crystal, McSorley Crystal)	E½ sec. 24, T. 5 N., R. 11 E., M.D.M.	R. P. M. Davis, 666 Rudd Rd., Vista	....	(MSP 7/24/80:52; 12/6/84: 360; 12/5/85:376; Irelan 88: 148; MSP 1/2/89:22; Crawford 96:107; MSP 2/12/98: 182; 2/17/00:2; Storms 00: 124; Kunz 05:65-66; Mineral Resources of U. S. 08:Pt. I, 332; Lindgren 11:209; Tucker 15: 118; Logan 36:161, 170-71; Mineral Resources of U. S. 27: Pt. I, 274; Logan 36:344; Julihn 38:70; Averill 43:139; 43a:315-16; Durrell 44:423-433; Minerals Yearbook 45: 280; Records, Calif. Debris Comm.; herein.)
C-44	Gunter and Hartlief	NW¼ sec. 20, T. 4 N., R. 13 E., M.D.M., in Old Gulch, 3 mi. NE of Calaveritas	John P. Freccero, San Andreas	On Fort Mountain channel. Pay gravel 5 to 7 ft. thick at 25-ft. depth.	Drift mine. Active 1850s, when several shafts sunk 40 to 100 ft. Active again 1899. (MSP 8/ 12/99:177.)
C-45	Hard Rock.....	SE¼ sec. 26, T. 5 N., R. 11 E., M.D.M., in Chili Gulch, 3½ mi.	Mr. Courtley.....	On Deep Blue Lead or Concentrator channel. Gravel uncemented, contains many	Drift mine. Reconditioning old 40-ft. vertical shaft began June 1957; drifting began Oct.; 90-

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-45	Hard Rock—Continued	SSW of Mokelumne Hill		6-inch cobbles. Gold 80 percent flour; small nuggets of melon-seed size are clean, flat, and well-worn.	ft. drift to NE by Dec. 1957. Old shaft 300 ft. to SE worked late 1940s. Gravel washed in small trommel, Knudsen bowl, sluices.
C-46	Hartman.....	NE¼ sec. 25, T. 5 N., R. 11 E., M.D.M., in Old Woman Gulch 2½ mi. S of Mokelumne Hill	Mrs. Alma M. Cohn, 1005 N. Hunter St., Stockton	On Tunnel Ridge channel. Channel 50 ft. wide contains 4 to 6 ft. of pay gravel on slate bedrock.	Drift mine. Active prior to 1900; 2 shafts, each 50 ft. deep. (Crawford 96:103; Tucker 15:118.)
C-47	Hedrick.....	NE¼ sec. 28, T. 4 N., R. 12 E., M.D.M., 2 mi. SE of San Andreas	F. V. Hedrick, et al., 1305 Corduleras Ave., San Carlos	On Central Hill channel. Channel shallow, 400 ft. wide; center portion 8 ft. deeper, 100 ft. wide. Pre-rhyolite gravel cut by channel containing rhyolite tuff and gravel. Both channels have pay gravel, are capped by fine oxidized gravel.	Drift and hydraulic mine. By 1872, estimated 2,963 yds. gravel had yielded $1450. About 3200 yds. gravel washed 1900s. Active 1910s. Developed by hydraulic pits, 5 shafts 50 to 120 ft. deep, and 3 tunnels 400 ft. long. (Hammond 90:136; Lindgren 11:203-04; Tucker 15:118; Records, Calif. Debris Comm.)
C-48	Hexter.....	NW¼ sec. 13, T. 5 N., R. 11 E., M.D.M.	John B. Fershtand, 1501 Summit, Fort Worth 3, Texas	.....	(MSP 8/22/96:168; 12/23/99:723; Lindgren 11:208; MSP 5/18/12:707; Tucker 15:118-119; MSP 12/29/17:943; Logan 36:345; Julihn 38:71; herein.)
C-49	Hughes & Sons Deep Gravel	NW¼ sec. 25, T. 5 N., R. 11 E., M.D.M., 2½ mi. S of Mokelumne Hill, in Chili Gulch	Mildred S. Barker, c/o First Western Bank & Trust Co., Oakdale	On Deep Blue Lead.....	Drift mine. Active 1870s; 370-ft. inclined shaft, 450-ft. drift, 10-stamp mill. (MSP 1/25/73:52; 1/27/77:53.)
C-50	Humboldt.....	NE¼ sec. 9, T. 4 N., R. 13 E., M.D.M., 1 mi. S of Mountain Ranch	Clyde C. and Glenys Sherwood, P.O. Box 3, Mountain Ranch	On El Dorado channel. Gravel consists of subrounded schist, quartzite, and minor quartz on black schist bedrock.	Hydraulic mine. Shallow pit 10 ft. deep, 200- by 300-ft. area.
C-51	Independence...	NW¼ sec. 26, T. 6 N., R. 13 E., M.D.M., just W of Independence on Independence road	Not determined.....	Gravel is subangular schist and quartzite in red soil.	A few acres of surface gravel have been scraped to 3-ft. depth. Washed by 2½- by 25-ft. trommel, short sluices.
C-52	Independence...	SE¼ sec. 22, T. 6 N., R. 13 E., M.D.M., on Independence Creek, 1 mi. NW of Railroad Flat	Not determined.....	.....	Hydraulic mine. Active 1908-10, when 9,365 yds. gravel washed. (Records, Calif. Debris Commission.)
C-53	Indian Gulch (Indian Ravine)	NW¼ sec. 35, T. 5 N., R. 11 E., M.D.M., 3½ mi. S of Mokelumne Hill, in Old Woman Gulch	Eunice N. Van Winkle, Port Chicago	On Kraemer channel. Blue pay gravel 6 ft. thick, 60 ft. wide.	Drift mine. Active 1864-71. Pay gravel stuck by 1100-ft. tunnel, 75-ft. incline 1868. Active drifting and breasting 1868-71. Tailings reworked late 1871. Clean-up yielded 50 oz. gold Sept. 1870, 300 oz. Dec. 1871. Workings included 3000-ft. tunnel, crosscuts, breasts. (MSP 3/10/66:146; 2/15/68:102; 9/24/70:220; 3/18/71:163; 12/23/71:388.)
	Indian Ravine....	.....	.....	.....	See Indian Gulch.
	Infernal.....	.....	.....	.....	See Eclipse.
	I. X. L.....	.....	.....	.....	See Balaklava.
C-54	Jack Rabbit.....	SE¼ sec. 17, T. 3 N., R. 13 E., M.D.M., 2 mi. N of Altaville	Purinton Mining Co., 1538 Hudson St., Redwood City	On Central Hill channel. Gravel capped by andesitic tuff and pebbles, and some rhyolite.	Drift mine; 1700-ft. tunnel driven by 1899; new 950-ft. tunnel driven by mid-1903. Active 1923; 3-stamp mill erected,

PLACER GOLD—Continued

Map No	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-54	Jack Rabbit—Continued				but no production. Drifting in 1923 extended 70 ft. downstream into Golden Treasure property. Old workings include shaft 191 ft. deep, about 1700 ft. of drifts. Gravel breasted across width of 35 ft. height of 7 ft.; said to have contained $2 to $10 per yd. See Purinton Mining Co. (Kerr 00; MSP 5/9/03:306; Lindgren 11:202-203; Logan 24:7.)
C-55	J. D. M.	Sec. 12, T. 4 N., R. 10 E., and secs. 7 and 18, T. 4 N., R. 11 E., M.D.M., 1 mi. NE of Valley Springs	Not determined	Pre-rhyolite gravel consists of metamorphic rocks, some quartz and serpentine.	Drift mine. Active 1936. 300-ft. vertical shaft through volcanic rock struck rim of gravel channel, was abandoned.
	Johnny Jumper	NW1/4 sec. 25, T. 6 N., R. 13 E., M.D.M., 1 1/4 mi. NE of Railroad Flat	Not determined	On Fort Mountain channel	Drift mine. 100-ft. shaft, 600-ft. bedrock tunnel driven prior to 1914. (Tucker 15:119.)
	Johnson	SW1/4 sec. 22 and NW1/2 sec. 27, T. 3 N., R. 13 E., M.D.M., 1 mi. N of Angels Camp	Romie Rolleri, Angels Camp	On Central Hill channel	Drift mine. Located prior to 1900. (Kerr 00.)
	Johnson	W1/2 sec. 27 and E1/2 sec. 28, T. 4 N., R. 12 E., M.D.M., 2 mi. SE of San Andreas, just NW of Hedrick drift mine	John R. Rathgeb, Gladys I. Airola	On Central Hill channel. Channel trends NW, is 100 ft. wide. Schist bedrock overlain by about 8 ft. of gravel, 20 ft. of rhyolite, 40 ft. of sand and gravel.	Hydraulic mine. Active prior to 1904. (MSP 11/14/03:325; Lindgren 11:203.)
C-56	Jupiter (San Domingo)	SE1/4 sec. 7 and NW1/4 sec. 17, T. 3 N., R. 13 E., M.D.M.	Walter V. and Norma M. Valente, Angels Camp		(MSP 12/4/80:360; 3/25/82:188; Crawford 96:109; Storms 00:125; MSP 7/11/03:27; Lindgren 11:203; Logan 36:350; Julihn 38:60; Records, Calif. Debris Comm.; herein.)
	K & S	Sec. 36, T. 4 N., R. 12 E., M.D.M., just E of Calaveritas	K & S Co. (James Knoll and Clarence Schipper), Box 378, Angels Camp	Six ft. of Recent gravel overlain by 2 ft. of soil rest on schist bedrock. Gravel averages 25 cents per yard.	Dragline dredge on Calaveritas Creek. Active Nov. 1953-55. Floating washing plant consists of trommel and sluices; had capacity of 100 yds. per hour. (James Knoll, 1954, personal communication.)
C-57	Kentucky	SE1/4 sec. 23, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Vallecito	Thomas B. Bishop Co., Whittle Bldg., 166 Geary St., San Francisco	On Central Hill channel. Slate and schist rims 200 ft. apart, but position of channel(s) on property not known.	Drift mine. Active prior to 1899. Adits 500 and 1,400 ft. long driven, but were above bedrock. Golden River Mining Co. did geophysical work and drilling before World War II; were preparing to sink shaft when closed Oct. 1942. (Kerr 00; Julihn 38:59-60; Averill 46:252.)
	Kinney	S1/2 sec. 27, T. 3 N., R. 13 E., M.D.M., 1/2 mi. NE of Angels Camp	Romie Rolleri, Angels Camp	On Central Hill channel	Drift mine. Active prior to 1899. (Kerr 00.)
	Kraemer				See Church Union.
	La Belle France				See Paul Cons.
C-58	Lampson	NW1/4 sec. 2 and NE1/4 sec. 3, T. 5 N., R. 13 E., M.D.M., 1 1/2 mi. S of Railroad Flat, near head of Jack Nelson Creek	Lee and Hazel L. Burch, 5730 Van Fleet Ave., Richmond	On branch of Fort Mountain channel. Channel trends E, is 40 to 100 ft. wide, 80 to 100 ft. deep. Average 9 ft. blue gravel covered by sand, gravel, rhyolite. Yield	Drift mine. First active 1884. Two shafts, 200 ft. of tunnels and drifts driven by 1889. Third shaft sunk 1890. Two-stamp mill 1899, 5-stamp mill 1902. Some small-scale work after 1920.

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-58	Lampson—Continued			estimated variously at $6 to $10 per yd. Lindgren reports test results of 50 cents per yd.	(MSP 7/13/89:24; 3/7/91:146; 8/15/91:93; Kerr 00; Lindgren 11:211; Ruby Taylor, personal communication, 1957.)
	Lancha Plana Dredge No. 2	.....	Lancha Plana Gold Dredging Co., La Lomita Rancho, Lockeford	Property on flood plain o Mokelumne River; 15 to 20 ft. fine auriferous gravel and sand rest on clay bedrock, overlain by 2 to 6 ft. of loam. Fine, flake gold said to average 10 cents per yd.	Connected-bucket dredge operated 2 mi. W of Camanche, on S bank Mokelumne River. Dredge purchased at Yreka from El Oro Co. 1926, operated at Lancha Plana for 6 years, and W of Camanche May 1936 to Feb. 1940. Dredge had 26-ft. digging depth, 32-ft. trommel, and 60 ft. of sluices. (Logan 36:345-46; Minerals Yearbook 1937-1940; Julihn 38:76-77; Averill 46:263.)
C-59	Last Chance.....	SW¼ sec. 2, T. 4 N., R. 11 E., M.D.M., 3½ mi. NW of San Andreas	John J. and Marian L. Snyder	On Deep Blue Lead. 200 ft. of gravel capped by soil in channel trending N. 40° W.	Drift mine. Two shafts, 175 and 50 ft. deep, sunk by 1892. Gravel treated in 3-stamp mill in 1900. (MSP 5/28/92:390; Preston 93:177; Kerr 00.)
	Lilly dredge.....	.....	.....	Gravel 4 to 18 ft. thick, uncemented, without boulders, on volcanic tuff bedrock. Fine flake gold thought to average 16 cents per yd. Bar gold sold to mine was 885 fine.	Dragline and floating washing plant moved from South Gulch to ridge 1 mi. S of Camanche 1937. Dragline with 2-yd. dipper moved gravel to 32-ft. scrubber-trommel and 11 sluices with area of 1,500 sq. ft. (Julihn 38:87-88.)
C-60	Lloyd..... (Watson Bros.)	SE¼ sec. 2 and NE¼ sec. 11, T. 4 N., R. 11 E., M.D.M.	.....	.....	(MSP 6/28/73:402; 7/11/03:27; Tucker 15:119; Minerals Yearbook 35:173; Logan 36:346-47; Julihn 38:61-63; herein.)
C-61	Lombardi..... (Ellen Vannan)	SW¼ sec. 25, T. 5 N., R. 11 E., M.D.M., 3 mi. S of Mokelumne Hill, just E of Highway 49	Not determined.....	On Deep Blue Lead. Channel trends SW, contains 7 ft. firmly placed gravel with large boulders, capped by 20 ft. rhyolite tuff.	Drift mine. Active as Ellen Vannan 1899-1900, when 400-ft. tunnel driven and 8-stamp mill installed; prospected during 1936 when workings consisted of 27-ft. vertical shaft, 40-ft. E-trending crosscut. Gravel treated by 9-ft. trommel, 24 ft. of sluices. (MSP 2/17/00:181; Storms 00:124; Logan 36:347; Julihn 38:66.)
	Lundt.....	.....	.....	.....	See Purinton Mining Co.
	Manitou.....	Sec. 19, T. 3 N., R. 14 E., M.D.M., 1 mi. NE of Vallecito	Not determined.....	On Central Hill channel. Channel contains well-rounded, clean, bedded gravel; no rhyolitic or andesitic pebbles; 500 ft. N of Manitou shaft, channel 30 to 40 ft. wide, containing quartz sand and gravel, has been explored. Both channels capped by rhyolite.	Drift mine. Workings include 167-ft. shaft inclined at 75°, and several shafts 40 to 70 ft. deep on northern channel. (Lindgren 11:202; Tucker 15:119.)
	Marshall.....	T. 4 N., R. 12 E., M.D.M., ½ mi. SE of San Andreas	Not determined.....	On Central Hill channel. Slate bedrock capped by 6 ft. pay gravel, 45 to 50 ft. rhyolite and gravel. At S end of property, narrow channel containing barren, unwashed cobbles cuts 36 ft. below main channel.	Drift mine. Workings include 5 shafts 90 to 127 ft. deep, 800-ft. drift, 2 long crosscut tunnels. (Lindgren 11:204.)
	McCann.....	SW¼ sec. 18, T. 5 N., R. 11 E., M.D.M.,	Not determined.....	On Tunnel Ridge channel....	Drift mine. Active early 1880s, 1916, 1922. Workings include

PLACER GOLD—Continued

Map No.	Name of claim, mine, or gorup	Location	Owner (Name, address)	Geology	Remarks and references
C-61	McCann—Continued	1½ mi. S of Mokelumne Hill			1200-ft. E-trending, incline tunnel. (MSP 6/25/81:424 Tucker 15:119; MSP 4/1/16 488; Logan 23:18.)
	McElroy	NW¼ sec. 28, T. 3 N., R. 13 E., M.D.M., 1 mi. N of Angels Camp		On intervolcanic channel over Central Hill channel. Shaft penetrates two intervolcanic channels and layers of rhyolitic ash, on western rim of channel basin.	Drift mine, 1200 ft. SW of Reine shaft. 200 ft. shaft sunk abou 1860-70; $100,000 taken ou before flooding halted opera tions prior to 1900. No late recorded activity until 1931 when Calaveras Central Gol Mining Co., Ltd. acquired th property. See Calaveras Centra Gold Mining Co., Ltd. (MSI 11/15/79:99; Kerr 00; Julih 38:42-45.)
	McSorley Crystal				See Green Mountain.
	Mead	Sec. 25, T. 5 N., R. 11 E., M.D.M., about 2½ mi. S of Mokelumne Hill	Not determined	On Deep Blue Lead	Drift mine. 50-ft. shaft and 8 stamp mill in 1914. (Tucker 15 119.)
	Mehrten Bros.	Not determined	Not determined		Operated non-floating washin plant along Mokelumne Rive in Camanche district, 1939-41 gravel carried to sluices b tractor-drawn carry-all. In 6½ months during 1941, 16,20 yds. gravel yielded 146 oz gold, 15 oz. silver. (Minera Yearbook 40:230; 41:245.)
C-62	Melones Dredging Co.	SW¼ sec. 24, T. 2 N., R. 13 E., M.D.M., 200 yds. E of bridge at Melones	Rt. 1, Box 509B, Sonora, Bart Pann, Mgr.	Gravel consists of igneous intrusive rock, chert, metamorphic rock, quartz, and some limestone.	Suction dredge. Floating dredge under construction early 1958 will have centrifugal pump wit 10-in. pipe and 1¾-in. scree on nozzle. Nozzle will hav revolving mechanism to stir u water; pipe feeds hopper an screen; oversize gravel will b stockpiled for road fill and ag gregate, undersize will go t riffles. Value of river sands an gravels unknown.
C-63	Merrimac	NW¼ sec. 11, T. 4 N., R. 11 E., M.D.M., 3½ mi. NW of San Andreas	Margaret Irwin, 1920 Mills Tower, 220 Bush St., San Francisco	On Deep Blue Lead and Kraemer channel.	Drift mine. Active 1866-67 1899-1901. In 1866, said t have yielded 108 oz. gold i 6 days. Shaft 75 ft. deep, brea 100 ft. wide. (MSP 12/15 66:374; Kerr 00; MSP 4/27 01:204.)
	Midas Placer Co.	Not determined	Not determined		Operated non-floating washin plant on channel at Penn min property in Camanche distric Apr. 1940 to Apr. 194 50,000 yds. gravel yielde 659 oz. silver in 1940. (Mir erals Yearbook 40:242; 4 245.)
	Milton Gold Dredging Enterprise		Not determined	Volcanic-tuff bedrock capped by 4 to 10 ft. medium-sized, tight gravel. Two million yds. mineable gravel with 15 cents per yd. of gold said to be available in 1938. All gold is fine.	Dragline and floating-washin plant in South Gulch. Activ Sept. 1935 through 194 Some 1¼ million yds. grav moved in 2 years after Sep 1935 at total cost of 12 cen per yd. Ground prospected b 7 bedrock shafts per ac before working. Dragline wi 1½ yd. bucket moved grav to plant with 4½- by 29-f scrubber-trommel and sluic

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-63	Milton Gold Dredging Enterprise—Continued				with 750 sq. ft. of riffles at average rate 110 yds. per hour. (Minerals Yearbook 1937-1940, Julihn 38:82-87.)
C-64	Missouri & Dolly Varden	SE¼ sec. 17, T. 3 N., R. 14 E., M.D.M., near Coyote Creek S of Douglas Flat	Cecil and Helen E. Uglow	On Central Hill channel.....	Drift mine; 92-ft. shaft to bedrock sunk prior to 1914. Gravel was treated in trommel, sluices, and 4 jigs. (Tucker 15:119.)
	Mooseh · l.....	Sec. 1?, T. 4 N., R. 13 E., M.D.M., 2 mi. NW of Sheepranch	Not determined.....	.....	Hydraulic mine near McKinney Creek; 41,500 yds. gravel washed 1906-08; 35,000 yds. 1910-11. Inactive until 3,165 yds. hydraulicked 1929-30. Idle since. (Records, Calif. Debris Comm.)
	Moser.....	.....	.....	.....	See Sport Hill.
C-65	Mountain Gold Dredging Co.	S½ sec. 8, T. 4 N., R. 11 E., M.D.M., on tributary of Young's Creek, just W of Double Springs Ranch	C. R. Garibaldi, Sutter Creek	Gold recovered from Recent gravel bed 8 to 10 ft. thick, capped by 4-ft. soil overburden. Gold averaged 38 cents per yd.	Dragline dredge. Active 1952-56. Dragline with 100 yd.-per-hr. capacity delivered gravel to 4- by 20-ft. trommel and multiple sluices. Bulldozer used to level and re-soil dredged ground.
C-66	Neilsen.....	NW¼ sec. 25, T. 5 N., R. 11 E., M.D.M.	C. W. Neilsen, San Andreas	.....	(Julihn 38:82; herein.)
C-67	North Hill.....	SE¼ sec. 23, SW¼ sec. 24 and NE¼ sec. 26, T. 3 N., R. 10 E., M.D.M., 2 mi. E of Jenny Lind	Smile Pacheco Jr., Star Route, Linden	.....	Hydraulic mine. Active 1890s. Closed down 1896, active again 1902-04. Extensively hydraulicked. Gravel several hundred feet wide. (Crawford 96: 99; Kerr 00; Tucker 15:120; Records, Calif. Debris Comm.)
C-68	North Star.....	SW¼ sec. 8, T. 5 N., R. 11 E., M.D.M., 1 mi. E of Mokelumne Hill	Raymond V. Garamendi, Mokelumne Hill	On Deep Blue Lead. Pay gravel up to 13 ft. deep rests on decomposed granitic and slate bedrock. Basalt cap. Average value of pay gravel reported to be $1.50 to $2.50 per ton.	Consolidated drift and hydraulic mines. Three Ball and Empire tunnels driven prior to 1883; hydraulicked 1894; 2 channels, one 61 ft. above the other, opened by 530-ft. and 620-ft. tunnels by 1896; 10-stamp mill used for cemented gravel 1896-97; drain tunnel driven 2100 ft. 1899-1905; by 1914, channel developed to width of 200 ft. by 2800 ft. tunnel, 1 mi. of workings. Idle since 1914. (MSP 1/20/83:36; 3/31/83: 220; 1/13/94:29; 6/6/96: 462; Storms 00:124; Lindgren 11:206-07; Tucker 15:120.)
C-69	North Star.....	S½ sec. 21 and NW¼ sec. 28, T. 3 N., R. 13 E., M.D.M., ½ mi. N of Altaville	North Star Placer Mining Co., c/o Norman C. Smith, 651 Casmalia Way, Sacramento 21	On Central Hill channel.....	31,600 yds. gravel hydraulicked 1894-1900. Worked as drift mine through 800-ft. tunnel prior to 1914. (Tucker 15:120; Records, Calif. Debris Comm.)
	O'Connell Blue Gravel	Sec. 21, T. 4 N., R. 12 E., M.D.M., 2 mi. SE of San Andreas	Not determined.....	On Central Hill channel.....	Drift mine. Shaft 56 ft. deep. (Tucker 15:120.)
C-70	Ohio (Buckminster, Uptograph)	NW¼ sec. 17, T. 3 N., R. 14 E., M.D.M.	Not determined.....	On Central Hill channel. Two channels separated by 15 ft. of rhyolite tuff. Lower channel up to 100 ft. deep, 200 ft. wide; upper channel up to 1000 ft. wide, capped by 100 ft. rhyolite tuff. Gravel consisting largely of Calaveras schist washed in 3- x 10-ft. trommel.	Hydraulic and drift mine at Douglas Flat. Hydraulicked prior to 1893. Drifting 1893-96(?). Hydraulicking ceased about 1900 when tailing pond S of highway was filled. Long N-trending tunnel prospected intermittently 1930s to early 1950s. (Crawford 94:99; 96: 121; Lindgren 11:201.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Old Stiff	SW¼ sec. 32, T. 3 N., R. 14 E., M.D.M., 1 mi. SSE of Vallecito	Clarence H. Pate, 720 East Barrymore, Stockton	On Cataract channel.	Drift and hydraulic mine. Activ 1890s; about 6800 yds. grav hydraulicked 1902-03; 14 ft. shaft reopened 1925; ac driven 275 ft. in soft limestor Aug.–Nov. 1935. (Kerr 0 Logan 25:161; 36:348-4 Records, Calif. Debris Comm
	Oro Water, Light and Power Co.		Not determined		Purchased partly constructe bucket dredge near Camanch 1912; completed constructio Successor in interest, Americ Dredging Company, organize 1913; operated first dredge ar built two others 1914, 191 Company active in Camanch area 1914-22. Said to ha worked 22 million yds. grav with average recovery of 10.2 cents per yd. Operations terr inated when suitable dredgi land not available. (MSP 1/ 13:66; 3/1/13:356; 1/16/1 120; 5/6/16:683; H. S. G bert, personal communicatio 1953.)
C-71	Ozark	SW¼ sec. 23, T. 3 N., R. 13 E., M.D.M., 2 mi. NE of Angels Camp	Mrs. Giovanni Val, Box 116, Angels Camp	On the Central Hill channel.	Drift mine. Active prior to 190 Rehabilitated 1916. Driftir again 1922. (Kerr 00; MS 6/10/16:876; 3/4/22:310.
	Paragon	Secs. 23 and 26, T. 3 N., R. 13 E., M.D.M., 2 mi. NE of Angels Camp	Not determined	On Central Hill channel. Pay gravel 3 ft. thick, 200 ft. wide. Tunnel penetrates 600 ft. of slate, 890 ft. of loose gravel.	Drift mine. Active prior to 191 (Tucker 15:120.)
C-72	Paul Cons. (La Belle France)	SE¼ sec. 13, T. 5 N., R. 11 E., M.D.M., 1 mi. S of Mokelumne Hill	Henry & Eugene Lancelle, c/o Alice Stegeman, 525 E. Hazelton Ave., Stockton	Gravel overlain by rhyolite tuff, clay, andesitic gravel.	Drift mine. Active prior to 187 as Bob Paul claim; 275-ft. i clined tunnel driven 187 Active 1880 as La Belle Franc mine; new tunnel driven, pa gravel produced 1880-8 Lindgren mentions Bob Pa hydraulic pit. (MSP 9/5/7 176; 10/23/80:260; 6/4/8 356; 6/24/82:412; Lindgr 11:208.)
	Peirano shaft				See Aetna Cons.
	Pellaton	SE¼ sec. 8, T. 5 N., R. 12 E., M.D.M., 1½ mi. SSE of Mokelumne Hill	Mary J. Garamendi, Mokelumne Hill	On Deep Blue Lead. Two channels exposed in workings.	Drift mine. Active prior to 189 Workings consist of tunnel ar 45-ft. shaft. See Veith min (MSP 6/24/99:670; Kerr 0 Lindgren 11:209.)
	Pennsylvania	W½ sec. 25, T. 5 N., R. 11 E., M.D.M., 3 mi. S of Mokelumne Hill	Not determined	On Chili Gulch and Deep Blue (?) Leads.	Drift mine. Two shafts, 60 ar 110 ft. deep, sunk prior 1911. (Kerr 00; Lindgren 1 209.)
	Plug Ugly				See Buck Bros.
	Purinton Mining Co.	NE¼ sec. 17, T. 3 N., R. 13 E., M.D.M., about 2 mi. N of Altaville	Daisy B. Purinton, 1538 Hudson St., Redwood City	On Central Hill channel. Bouldery, well-cemented gravel on slate and greenstone bedrock said to have averaged more than $4 per yard.	Owns portions of Jack Rabb Bonanza, Amazon Star Cons Golden Treasure, and Lun drift mines. These mines fi active prior to 1899. Compar dewatered and sampled pro erty in 1930. Developme includes 50-ft. inclined shal 1,400-ft. tunnel, and 900 ft. drifts. See Jack Rabbit ar Amazon Star Consolidate (Kerr 00; Logan 36:350.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Putnam	NE¼ sec. 11, T. 4 N., R. 11 E., M.D.M., 3 mi. NW of San Andreas, just S of Last Chance drift mine	Charles W. Neilsen, San Andreas	On Deep Blue Lead. Shaft penetrates 2 ft. surface gravel, 80 ft. lava, 8 ft. cemented, bouldery pay gravel. Gold 845 fine.	Drift mine. Active prior to 1893. (Preston 93:177; Crawford 96: 116.)
C-73	Quartz Hill	W½ sec. 23, T. 3 N., R. 13 E., M.D.M., 2½ mi. NE of Angels Camp, just N of Val Ranch mine	Mrs. Giovanni Val, Box 116, Angels Camp	.....	Placer mine. Worked by power shovel and stationary washing plant 1941; 11,270 yds. yielded 298 oz. gold, 30 oz. silver. (Minerals Yearbook, 1941.)
C-74	Railroad Hill	Center sec. 2, T. 3 N., R. 12 E., M.D.M., 1½ mi. SSE of Calaveritas	John A. and Walter R. Huberty, Box 158, San Andreas	On Fort Mountain channel...	Hydraulic mine. Giana and Luigi Demartini hydraulicked about 20,000 yds. gravel 1895-1904. (Records, Calif. Debris Comm.)
	Rainer (Rainier)	.....	.....	.....	See Victor, Calaveras Central.
C-75	Red Hill	SE¼ sec. 5, T. 5 N., R. 12 E., M.D.M., 2 mi. ENE of Mokelumne Hill	Tyler S. and Ida J. Yale, Mokelumne Hill	On Gopher channel. Gravel poorly sized; chiefly subrounded slabs of schist, some quartzite.	Hydraulic mine. First active Jan. 1875; active again early 1923 and mid-1940s. Last worked by bulldozer, carryall, and stationary washing plant. (MSP 1/30/75:69; Eng. & Min. Jour. Feb. 10, 1923:291; Logan 23:18.)
	Reed	Sec. 11, T. 4 N., R. 11 E., M.D.M., 3 mi. NW of San Andreas, near Latimer Gulch	Not determined.....	On Deep Blue Lead. S-trending channel developed by 616-ft., 20°-inclined shaft on rim; drifts 500 ft. N. and 450 ft. S.	Drift mine. Said to have yielded $80,000 prior to 1914. Gravel treated in 4-stamp mill. (Tucker 15:121.)
	Reiner (Reinier)	.....	.....	.....	See Victor, Calaveras Central.
C-76	Richie Hill	SE¼ sec. 26, T. 4 N., R. 12 E., M.D.M., ½ mi. N of Calaveritas	Dave Cademartori, San Andreas	On Fort Mountain channel. Bank 20 ft. high, 200 ft. long, exposes 1- to 18-inch slabs of quartz, schist, quartzite, greenstone.	Hydraulic mine. Gravel washed from bank, along sloping floor of cut, to sluices.
C-77	Rising Star (Cassinelli)	SE¼ sec. 2, T. 4 N., R. 11 E., M.D.M.	Roy and Edna Byrns, 73 Los Banos Ave., Daly City	.....	(MSP 4/15/71:228; 10/11/73: 229; 2/27/75:132; 5/28/92: 390; Preston 93:177; MSP 10/3/96:282; Kerr 00; Tucker 15:121; Logan 36:334-35, Plate VIII; Julihn 38:64-65; herein.)
	Rooney	Sec. 25, T. 5 N., R. 11 E., M.D.M., 3 mi. S of Mokelumne Hill	Not determined.....	On Deep Blue Lead. Channel trends SW, is 80 to 100 ft. wide. Gravel 4 to 6 ft. deep.	Drift mine. Active 1900s; 150-ft. vertical shaft, 5-stamp mill. (MSP 5/16/03:321; 7/18/-03:42; Tucker 15:121.)
	Roosevelt	.....	.....	.....	See Val Ranch.
C-78	Rose Hill (Emery)	NE¼ sec. 8, T. 4 N., R. 13 E., M.D.M., 1½ mi. WSW of Mountain Ranch	Clyde C. and Glenys Sherwood, Box 3, Mountain Ranch	On El Dorado channel. Channel 100 to 150 ft. wide, trends N. 75° E.; 8-ft. cemented auriferous gravel overlain by 42 ft. interbedded gravel, rhyolite tuff. Recovery 1901 was 37 cents per yd., less in following years.	Hydraulic mine. Worked by Lewis Emery Jr., 1899 and early 1900s with two monitors; about 214,000 yds. gravel washed, 12,000 of which under name, "Motto mine". Short drift driven from W end of pit 1953. (Kerr 00; MSP 2/17/00:181; Storms 00:124-125; Lindgren 11:211-212; Tucker 15:117; Clark 54:17, 21; Records, Calif. Debris Comm.)
C-79	Rough Diamond	SE¼ sec. 24, T. 5 N., R. 11 E., M.D.M.	Raymond and Mary J. Garamendi, San Andreas	.....	(MSP 12/29/77:402; 11/29/-79:341; 6/24/82:412; 3/17/-83:180; Tucker 15:121; Logan 36:350; Julihn 38:71; Averill 43:316; Durrell 44:423-433; Wright 50:207; herein.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-80 D-74	Rough Diamond .	NE¼ sec. 24, T. 3 N., R. 13 E., M.D.M., 2 mi. NW of Vallecito	Ila R. Taylor, 1032 Santa Clara Ave., Alameda	On Central Hill channel. Dump contains angular fragments granitic rock.	Drift mine; 3 men employed 19 Vertical shaft. (Tucker 15:12
	Round Butte.....	Secs. 6 and 7, T. 4 N., R. 14 E., M.D.M., 1 mi. NW of Sheep Ranch	Not determined.....	On Fort Mountain channel...	Hydraulic mine; 14,250 y gravel hydraulicked 189 1900; 8,000 yds. Oct. 190 Nov. 1902. (Kerr 00; Recor Calif. Debris Comm.)
C-81	Safe Deposit....	NE¼ sec. 25, T. 5 N., R. 11 E., M.D.M., 2½ mi. S of Mokelumne Hill	Alice R. Snavely, 809 2nd St., Woodland	On Deep Blue Lead.....	Drift and hydraulic mine. F active and 5-stamp mill install 1878. Gravel struck by 376 E-trending, inclined tunn 1879. Idled prior to 1900. A tive again 1917-20, wh 27,400 yds. gravel wash (MSP 1/26/78:52; 6/22/7 388; 11/29/79:341; Recor Calif. Debris Comm.)
	San Andreas Gold Dredging Co.	.....	Not determined.....	.....	Operated 1½-yd. dragline dred in San Andreas area mid-19 to mid-1939, then operated dragline dredges in Moth Lode area through 194 Worked 22 properties, inclu ing Bowling Green (1939-4 Canepa (N of Vallecito, 194 Hageman (1941), and Lo bardi (2 mi. SE of Mokelum Hill, 1941). (Minerals Ye book, 1939-41.)
	Sand Hill.....	SW¼ sec. 1 and NW¼ sec. 12, T. 4 N., R. 9 E., M.D.M.	Pacific Gas & Electric Co., 245 Market St., San Francisco	.....	Hydraulic mine; 35 ft. of grav exposed by 1896, idle 1915. Property now cover by tailings of Gold Hill Dred ing Co. (MSP 10/10/96:30 Tucker 15:120.)
	San Domingo....	.....	.....	.....	See Jupiter.
	Shaw.....	.....	.....	.....	See Duryea.
C-82	Slab Ranch..... (Calmo)	NW¼ and SE¼ sec. 27, T. 3 N., R. 13 E., M.D.M.	c/o P. N. Alexander, 1567 Hiawatha Ave., Stockton	.....	(MSP 3/4/22:310; Logan 24: 178; 25:161; Minerals Ye book 26; Young 29; Logan 3 351; Julihn 38:42, 47; herein
	South Fork.....	Center sec. 30, T. 4 N., R. 12 E., M.D.M., 2 mi. SSE of San Andreas, W of the South Fork Calaveras River	Not determined.....	Gravel consists of 3 benches covered by 10 to 30 ft. of overburden containing large boulders. Width of benches totals 400 ft.; gravel up to 10 ft. thick. Compact, medium-coarse gravel rests on schist bedrock, contains no clay, little sand; averaged $3.50 per yd. in coarse, 900-fine gold. Deposit reported 1938 to contain 100,000 yds. mineable gravel.	Gravel deposit. Worked by dr ing in 1920s, by gasoline sho and moveable washing pla 1936, by 382 ft. of shafts a drifts 1937. Gravel washed 2½- by 12-ft. scrubber-tromm and sluices. (Logan 36:35 Julihn 38:92-93.)
	South Gulch.....	Secs. 33 and 34, T. 3 N., R. 10 E. and sec. 4, T. 2 N., R. 10 E., M.D.M., 2 mi. N and NW of Milton	Not determined.....	Creek gravels 300 ft. wide, 7 ft. deep, mostly uncemented, said to average 22 cents per yd. Soft clay bedrock.	Surface gravels in South Gulc Worked by Lilly 1¼-yd. dra line dredge Oct. 1934 to Se 1935, by Milton Gold Dred ing Enterprise, which see, 19 through 1940. Lilly dred recovered 336 oz. gold, 14 o silver 1934; 250,000 y gravel washed 1935 in 20- trommel and sluices. (Minera Yearbook 1935-1936; Log 36:351-352.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
C-83	South Hill	S½ sec. 26, T. 3 N., R. 10 E., M.D.M., 2 mi. SE of Jenny Lind	Smile Pacheco, Jr., Star Route, Linden		Hydraulic mine. Extensively hydraulicked. Active prior to 1900; idle by 1915. (Kerr 00; Tucker 15:120.)
C-84	Sport Hill (Moser)	NE¼ sec. 18, T. 5 N., R. 12 E., M.D.M., 1 mi. SE of Mokelumne Hill	Mokelumne River Power & Water Co.	On Tunnel Ridge channel	Hydraulic claim. Active intermittently 1865-99. Hydraulicked 1865-71; old hydraulicked debris in gulch re-washed 1871-73; hydraulicked again until sold to Roanoke Mining Co. for $21,000 in 1896. Worked shortly thereafter as lode claim. Said to have yielded $18,400 during 1877-84. (MSP 3/4/65:141; 1/27/72:52; 5/-3/73:277; 7/12/73:21; 4/-21/77:245; 9/14/78:164; 6/-26/80:405; 12/27/84; 2/1/-96:83; 6/13/96:486; Kerr 00.)
C-85	Spring Valley	S½ sec. 17, T. 4 N., R. 11 E., M.D.M., 2½ mi. NE of Valley Springs	Not determined	Alluvial and Tertiary (?) gravels.	Eastern shaft sunk 1861 on N rim of channel; worked intermittently through 1953; 176-ft. shaft to bedrock, 350 ft. of drifts in poorly sorted, tight gravel, said to have yielded $36,000 in early days. In 1953, shaft reconditioned and 300 tons gravel washed in 3- by 5-ft. scrubber-mill and sluices. Western shaft 180 ft. deep; 270-ft. crosscut failed to intersect channel. Worked 1939-41. Surface gravels mined to 15 ft. by steam shovel in early 1930s; yield of $12,280 reported in 1936. These gravels worked 1952-56 by Garibaldi dredge, which see. (Lindgren 11:210; Logan 36:352; McCarty: personal communication, 1957.)
	Square Head				See Chris Anderson.
	Stagan Mining Co.		Not determined		Operated 1¾-yd. dragline dredge on Robie Ranch, about 2 mi. SW of Jenny Lind, 1940-41. Also worked on Hunt (1940) and Willits (1941) Ranches. In 1940, washed 500,000 yds. of gravel, recovered 2,902 oz. gold, 182 oz. silver; additional small amount gravel washed in stationary plant on Robie ranch. (Minerals Yearbook, 1940-41.)
	Stockton Hill	SE¼ sec. 12, T. 5 N., R. 11 E., M.D.M.	Not determined	On Stockton Hill channel. Tight gravel on schist bedrock contains blue clay, boulders.	Drift mine on NE slope Stockton Hill, in Mokelumne Hill townsite. Active 1903-04, when 730 ft. of drifts driven prior to 1900 retimbered; and 1935-36, when worked by 104-ft. vertical shaft, 175 ft. of drifts. Gravel washed in trommel, sluices. (Kerr 00; MSP 1/2/04:12; Tucker 15:122; Logan 36:352-53.)
C-86	Table Mountain	SE¼ sec. 10, SW¼ sec. 11, NW¼ sec. 14, and NE¼ sec. 15, T. 4 N., R. 13 E., M.D.M., 2 mi. SE of Mountain Ranch	Not determined	On El Dorado channel. Gravel 1,000 ft. wide, 20 ft. deep, said to average 25 cents per yd.; contains metamorphic and igneous cobbles and some quartz on altered schist bedrock.	Hydraulic mine. Active 1914. (Tucker 15:122.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Taylor				See Clark.
	Texas	Secs. 16 and 17, T. 3 N., R. 14 E., M.D.M., at Douglas Flat, adjoining Forty-Nine mine	Not determined	On Central Hill channel	Drift mine. Active prior to 1900. Shaft 90 ft. deep. (Kerr 00; Tucker 15:122.)
C-87	Union Shaft	NE¼ sec. 11, T. 4 N., R. 11 E., M.D.M., E of Latimer Gulch, 3 mi. NW of San Andreas	Sterling Carter, Murphys	On Central Hill and Deep Blue Lead. Pay gravel first struck 1869.	Drift mine. Property worked and flooded intermittently until 1875. Last recorded production 72½ oz. gold 1890. By 1915, developments included shaft 100 ft. deep, and 1,200-ft., N-trending drift at bottom of 150-ft. shaft. (MSP 11/27/69: 342; 3/15/90:182; Lindgren 11:209; Tucker 15:122.)
	Uptograph				See Ohio.
C-88	Val Ranch (Roosevelt)	SW¼ sec. 23, T. 3 N., R. 13 E., M.D.M., 2 mi. NE of Angels Camp	Mrs. Giovanni Val, Angels Camp	On Central Hill channel	Drift mine. Drifts run prior to 1915 through 60-ft. shaft. Sub-lessee operated power shovel and stationary washing plant May-Oct. 1942; 6,245 yds. gravel from pit yielded 69 oz. gold, 7 oz. silver. Again active 1956; gravel moved from old pit and trench to the S by bulldozer and earthmover; washed in 4- by 20-ft. chaindriven double screen scrubber-trommel and sluices. (Tucker 15:121; Minerals Yearbook 1942.)
	Vallecito Consolidated	Not determined	Not determined		Drift-mining company that owned properties on channel between Vallecito and Douglas Flat, including Bowling Green, which see. Company also known variously as Vallecito Con. Mining Co., Vallecito Gold Mining Co., and Vallecito Mining Co. Active 1890s to 1910s. Some of company's property later acquired by Thomas B. Bishop Co. Workings included at least 3 shafts and 400-ft. tunnel. (Crawford 94: 99, 482; 96:122; Kerr 00; Lindgren 11:210; Tucker 15: 123.)
	Vallecito Consolidated	Not determined	Not determined		Drift mine at N end of Vallecito, operated by Donald Steffa and others who later organized Vallecito Western Mining Co. Active Jan. 1920 to June 1923. Sank 192-ft. shaft and 110-ft. winze. Drifts were run NE and S at 106-ft. and 192-ft. levels; $10,000 reportedly recovered from gravel accumulated in large fissure in limestone; not a part of an existing Tertiary channel. Workings total 5,300 ft. (Logan 24:6-7; Young 29:395-6.)
C-89	Vallecito Western	SW¼ sec. 24, T. 3 N., R. 13 E., M.D.M.	Thomas B. Bishop Co., 166 Geary St., San Francisco		(Logan 24:6-7, 178; 25:161; Minerals Yearbook 1929; Young 29:395-6; Steffa 32; Minerals Yearbook 1935-41; Logan 36: 353-5; Julihn 38:38-42; Averill 46:247-251; herein.)

PLACER GOLD—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
-90	Vandervoort	NW¼ sec. 29, T. 3 N., R. 14 E., M.D.M., 1 mi. E of Vallecito	Not determined	On branch of Central Hill channel. Branch of Central Hill channel capped by andesite and rhyolitic tuff; gravel consists of well-rounded quartz, limestone, and metamorphic pebbles on schist bedrock. Branch of Columbia channel contains quartz gravel with few boulders on limestone bedrock; pay gravel said to average $3 to $4 per ton.	Drift mine. Active intermittently 1933-37. 250-ft. vertical shaft sunk near road; 50 ft. drift to E on 240-ft. level penetrated 12 ft. of gravel on W rim of channel; workings abandoned 1935. Later, 194-ft., 45°-inclined shaft sunk to W from E of above shaft; 100-ft. crosscut driven W to N-trending branch of Columbia channel; 100-ft. drift driven N along channel. (Logan 36: 355; Julihn 38:73-74.)
-91	Veith	S½ sec. 18, T. 5 N., R. 12 E., M.D.M., 1½ mi. S of Mokelumne Hill	Mary J. Garamendo, Mokelumne Hill	On Deep Blue Lead	Hydraulic and drift mine. Hydraulicked prior to 1873. $70,000 yield reported in Min. & Sci. Press, 1874-82 (numerous references). Operated as "Mammoth" mine beginning 1879. Drifting began 1885. Veith and Pellaton mines worked as unit 1900s and 1916. (MSP, numerous references, 1873-84; Kerr 00; MSP 11/14/03:325; 2/-5/16:214.)
	Victor (formerly Rainer, Reiner, Rainier, or Reinier shaft)	NE¼ sec. 28, T. 3 N., R. 13 E., M.D.M.			(MSP 6/20/08:825; 12/14/12: 774; 8/9/13:239; Tucker 15: 120; MSP 4/9/21:507; 5/-28/21:758; 7/9/21:69; Logan 22:99; 23:18; 24:7, 178; 25: 161; Minerals Yearbook 1927; Mines Register 37:184; Julihn 38:42; herein; see also Calaveras Central mine.)
	Wallace Dredging Co.		Gold Hill Dredging Co., 311 California St., San Francisco 4	Auriferous lone(?) gravel 4 to 8 ft. thick overlain by 10 to 12 ft. hardpan. Gravel tight, contains no boulders. Gold fine, spotty in distribution.	Three cu. ft. connected-bucket dredge active on Bear Creek near Wallace, Oct. 1936-Oct. 1939. Gravel washed in 26-ft. scrubber-trommel and 700 sq. ft. of sluices. (Julihn 38:79-81.)
	Watson Bros.				See Lloyd.
	What Cheer	NW¼ sec. 24, T. 5 N., R. 11 E., M.D.M.			(MSP 1/7/71:4; 1/27/72:52; 5/2/85:288; 10/29/87:280; 10/21/99:465; Tucker 15:123; Logan 36:329; Julihn 38:66-68; Averill 46:254; herein.)
-92	Whiskey Hill	N½ sec. 27, T. 3 N., R. 10 E., M.D.M., 1 mi. SE of Jenny Lind	Smile Pacheco, Jr., Star Route, Linden		Hydraulic mine; 800-ft. tunnel for fall of water built 1864-72; two cleanups of $5,000 reported Aug. 1872, Feb. 1874. (MSP 2/3/72:68; 8/24/72: 116; 2/21/74:116-117; Tucker 15:120.)
-93	Wild Goose	E½ sec. 17, T. 3 N., R. 14 E., M.D.M., at Douglas Flat	David T. Copello, Altaville	On Central Hill channel	Drift mine. First active 1867; last active mid-1900s; 150-ft. shaft with 15-ft. sump, drifts. (MSP 8/3/67:70; 4/9/04:249.)
-94	Worth's Hill	NE¼ sec. 2, T. 4 N., R. 11 E., M.D.M., 4 mi. SSW of Mokelumne Hill, in Chili Gulch	John J. and Marian L. Snyder, Valley Springs	Gravel 90 ft. thick; consists of poorly sorted metamorphic pebbles and cobbles; some sand beds. Pit 400 ft. long.	Drift and hydraulic mine. Drifted in 1860s; hydraulicked 1873-74. (MSP 6/28/73:402; 12/-12/74:372.)

IRON

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
D-50	Big Trees (Calaveras)	SW¼ sec. 32, T. 4 N., R. 14 E., M.D.M.	Not determined		(Aubury 06:297; Logan 25:162, herein.)
	Bonanza	T. 5 N., R. 12 E., M.D.M., 7 mi. SE of Mokelumne Hill	Not determined		Undeveloped prospect. (Logan 25:162.)
	Calaveras				See Big Trees.
	Detert				See Iron Monarch.
	Indian Creek	Sec. 34?, T. 4 N., R. 13 E., M.D.M., by Indian Creek near Esmeralda	Not determined	Limonite in quartz-mica schist.	(Turner 94:6; Logan 25:162.)
D-51	Iron Monarch (Detert)	E½ sec. 11, T. 4 N., R. 10 E., M.D.M.	Not determined		(Aubury 06:297; Logan 25:162 herein.)
D-52	Ponderosa	NE¼ sec. 2, T. 3 N., R. 13 E., M.D.M., 2 mi. SE of Esmeralda by Ponderosa Way	Not determined	Massive magnetite in thin layers in antigorite.	Prospect; developed by oper pit. (Clark 54:21.)

LIMESTONE

	Calaveras Cement	Secs. 25, 28 and 36, T. 4 N., R. 12 E., and secs. 29 and 30, T. 4 N., R. 13 E., M.D.M.	Calaveras Cement Co., 315 Montgomery St., San Francisco		See also Calaveritas-Esmeralda Columbia, Gambetta, and Ken tucky House deposits. (Logan 25:165, 167; 36:232-233; 47 216-217; Bowen 48:58-60 49:38-39; Ross 50:1-62; Turne 51:315; Clark 54:14-17, 18 19; herein.)
D-53	Calaveritas-Esmeralda	Secs. 25 and 36, T. 4 N., R. 12 E., and secs. 27, 28, 30, 31, 33, 35 and 36, T. 4 N., R. 13 E., M.D.M.	Many, including Calaveras Cement Co., 315 Montgomery St., San Francisco		See also Calaveras Cement Com pany. (Logan 36:227, 232 233; 47:216-217; Clark 54 14-17, 18-19; herein.)
D-54	Cave City	Secs. 3, 4, 10, 11, 13, and 14, T. 4 N., R. 13 E., M.D.M.	Several, including E. A. Thomas, Mountain Ranch		(Turner 94:3; Logan 25:167; 47 217; Clark 54:17; herein.)
D-55	Columbia	Secs. 14, 21, 22, 27, 28, 29, 31, 32, 33 and 34, T. 3 N., R. 14 E.; secs. 4, 5, 6, 7, and 8, T. 2 N., R. 12 E.; and sec. 36, T. 3 N., R. 13 E., M.D.M.	Many, including Calaveras Cement Co., 315 Montgomery St., San Francisco; and C. J. Loomis, San Andreas		(Turner 98:4; Logan 47:216 herein.)
D-56	Gale Ranch	Secs. 20 and 29, T. 5 N., R. 11 E., M.D.M.	Not determined		See Valley Springs-Mokelumn Hill deposits. (Logan 47:217
D-57	Gambetta	Sec. 36, T. 6 N., R. 12 E.; sec. 31, T. 6 N., R. 13 E.; sec. 1, T. 5 N., R. 12 E.; and secs. 6, 7 and 18, T. 5 N., R. 13 E., M.D.M.	Calaveras Cement Co., 315 Montgomery St., San Francisco		Herein.
	Jesus Maria-Rich Gulch deposits	Secs. 15 and 16, T. 5 N., R. 12 E., M.D.M.	Many, including Willard Hughes, Mokelumne Hill		Herein. See also Gambetta de posit.
D-58	Kentucky House	Secs. 29 and 32, T. 4 N., R. 12 E., M.D.M.	Several, including Calaveras Cement Co., 315 Montgomery St., San Francisco		See also Calaveras Cement Com pany. (Logan 25:165; 36:227 232-233; 47:216-217; herein.

LIMESTONE—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Le Clerq				See Valley Springs-Mokelumne Hill deposits. (Tucker 16:128; Logan 47:217.)
D-59	Markwood Ranches	N½ sec. 32, T. 5 N., R. 11 E., M.D.M.	Mary E. Markwood, Valley Springs (1947)		See Valley Springs-Mokelumne Hill deposits. (Aubury 06:65; Tucker 16:128; Logan 47:217-218.)
D-60	McNamara	NW¼ sec. 32, T. 5 N., R. 11 E., M.D.M., 5⅓ mi. NE of Valley Springs	Josephine McNamara et al., Valley Springs (1947)		See Valley Springs-Mokelumne Hill deposits. (Aubury 06:65; Tucker 16:128; Logan 47:218.)
D-61	Murphys	Secs. 31 and 32, T. 4 N., R. 14 E.; sec. 36, T. 4 N., R. 13 E.; and secs. 4, 5, 6, 7, 8, 9, and 10, T. 3 N., R. 14 E., M.D.M.	Many		(Turner 98: pl. I; Logan 47:216; herein.)
	Penn	Sec. 32, T. 5 N., R. 11 E., M.D.M., 5.0 mi. by road from Valley Springs	New Penn Mines, Inc., 70 Pine St., New York 5, N.Y.		See Valley Springs-Mokelumne Hill deposits. (Aubury 06:65; Tucker 16:129; Logan 47:218.)
	Valley Springs-Mokelumne Hill deposits (Gale Ranch, Le Clerq, Markwood, McNamara, Penn, Watt and Field, Yount)		Many		Herein.
D-62	Watt and Field	N½ sec. 4, T. 4 N., R. 11 E., M.D.M.	Hannah R. Watt et al., Valley Springs (1947)		See Valley Springs-Mokelumne Hill deposits. (Logan 47:218.)
	Young	Sec. 4, T. 4 N., R. 11 E., M.D.M.	Not determined		See Valley Springs-Mokelumne Hill deposits. (Aubury 06:66; Tucker 16:128-129.)

MANGANESE

D-63	Airola	SW¼ sec. 35, T. 3 N., R. 13 E., M.D.M., 1½ mi. E of Angels Camp	Emma Airola, San Andreas	Manganese oxide in NW-striking metachert lenses in phyllite and schist.	Active during World War II. Developed by open pits. (Trask 43:72, 106; 50:38-40.)
D-64	Big Little Bear (Calaveras Manganese)	SW¼ sec. 11 and NW¼ sec. 14, T. 3 N., R. 11 E., M.D.M., 7 mi. SE of Valley Springs in Bear Mountains	Alvin Maxwell and Elmer Walker, San Andreas (1950)	Psilomelane lenses up to 1 ft. thick in chert. Ore zone up to 4 ft. thick and 150 ft. long strikes N. 40° W. and dips 55° NE.	Developed by open pits. (Trask 43:76, 106; 50:40.)
	Calaveras Manganese				See Big Little Bear.
D-65	Callahan	W½ sec. 34, T. 2 N., R. 11 E., M.D.M., 7½ mi. SE of Milton	H. L. Donner, Milton	Bed of psilomelane-bearing chert up to 2 ft. thick strikes N; ore contains up to 40% Mn.	Developed by open cut. (Trask 43:76, 106; 50:40-41.)
D-66	Carley	SE¼ sec. 12, T. 3 N., R. 13 E., M.D.M., 2 mi. W of Murphys	Carley Ranch, Murphys (1950)	Prospect containing psilomelane with spessartite and limonite in sericite schist.	Developed by small pit. (Trask 43:76, 106; 50:41.)
	Cave City	Sec. 14, T. 4 N., R. 13 E., M.D.M., 3½ mi. SE of Mountain Ranch	E. A. Thomas, Mountain Ranch	Low-grade prospect containing manganese and iron oxide in schist.	Developed by small open pit. (Trask 43:76, 106; 50:41.)

MANGANESE—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
D-67	Daniels (Dennis)	N½ sec. 6, T. 2 N., R. 11 E., M.D.M., 4 mi. E of Milton	Mrs. Minnie Dennis, Jenny Lind (1942)	A 1- to 3½-ft. bed of psilomelane and pyrolusite with chert, quartz, and rhodonite. Ore averages 20% Mn.	Prospected during World War Exposed by series of open cu (Trask 43:76, 106; 50:41-42
	Dennis	.....	.....	.....	See Daniels.
D-68	Fortner Ranch	SW¼ sec. 4, T. 4 N., R. 12 E., M.D.M., 3½ mi. NE of San Andreas	Dorothy Ludwig, Oakland (1942)	Partly oxidized NW-striking beds of spessartite in quartz and quartzite.	Exposed in open cuts. (Bradle 18:31; Logan 25:163; Tra 43:76, 106; 50:42-43.)
D-69	Gorham	SE¼ sec. 18, T. 1 N., R. 13 E., M.D.M., 6 mi. SE of Copperopolis	Not determined	Rhodonite with small amounts manganese oxide.	(Trask 43:76, 107; 50:43.)
	Murphys prospects	.....	Not determined	Partly oxidized spessartite and rhodonite in metachert.	Series of small prospects in Mu phys area. (Trask 50:43-44.)
	Harrington	T. 3 N., R. 14 E., M.D.M., 5 mi. E of Murphys near Collierville	Not determined	A 1- to 3-ft. thick lens 15 ft. long.	Developed by 20-ft. shaft wi 20 ft. of drifts. (Trask 43:7 107; 50:44.)
	Hauselt	T. 3 N., R. 13 E., M.D.M., 2½ mi. NE of Murphys	Not determined	Prospect containing manganiferous chert.	(Trask 43:75, 107; 50:44.)
	Joses Ranch	N½ sec. 5, T. 4 N., R. 13 E., M.D.M., 2 mi. W of Mountain Ranch	L. B. Joses, Mountain Ranch (1942)	Prospect of manganiferous chert.	Developed by open cut. (Tra 43:76, 107; 50:45.)
D-70	Kellogg	S½ sec. 4, T. 2 N., R. 12 E., M.D.M., 6 mi. W of Altaville on Bear Mountain Ridge	W. M. Kellogg, Altaville (1942)	Bed of manganese oxide 1 to 6 ft. thick in chert and phyllite strikes N. 30°-35° W.	Developed by open cuts. (Loga 25:163; Trask 43:76, 10 50:45-46.)
D-71	Lavagnino	NE¼ sec. 3, T. 2 N., R. 13 E., M.D.M., 1 mi. SW of Angels Camp	Steve Lavagnino, Angels Camp (1942)	Prospect of psilomelane in phyllite.	Developed by open pit. (Tra 43:107; 50:46.)
	Pescia	T. 4 N., R. 13 E., M.D.M., 6 mi. N of Murphys	Not determined	Prospect containing manganiferous chert.	(Trask 43:107; 50:46.)
D-72	Soapstone	S½ sec. 18, T. 4 N., R. 13 E., M.D.M., 1 mi. SW of Sheep Ranch	E. G. Staples, Sheep Ranch	Prospect containing manganese oxide with spessartite crystals in metachert and schist.	Developed by open pit. (Tra 43:107; 50:46-47.)
	Sunshine	Not determined	C. S. Pierce, Hughson (1942)	.....	Prospect near Murphys. (Tra 43:108; 50:47.)
	Zurcher	T. 4 N., R. 14 E., M.D.M., 3½ mi. N of Murphys	Not determined	Prospect consisting of manganese-stained metachert.	(Trask 43:76, 108; 50:47.)

MINERAL PAINT

	Holmes Ranch	T. 4 N., R. 10 E., M.D.M., near Campo Seco	Not determined	Decomposed slate with limonite.	Long idle. (Tucker 16:130; Loga 25:168; Symons 30:152.)
	Late Ochre	Sec. 14?, T. 4 N., R. 10 E., M.D.M., ½ mi. W of Valley Springs	Not determined	Yellow to dark red ochre in belt of NW-striking slate.	Active 1890s and possibly early 1900s. (Aubury 06:33 Logan 25:168; Symons 3 153.)
	Rhoden	T. 4 N., R. 10 E., M.D.M., 3 mi. from Valley Springs	Not determined	Prospect containing brown and yellow ochre.	(Logan 25:168; Symons 30:153

QUARTZ CRYSTAL

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Calaveras Crystal	.....	.....	.....	See Green Mountain placer gold mine.
D-73 C-43	Green Mountain	E½ sec. 24, T. 5 N., R. 11 E., M.D.M.	R. P. M. Davis, 666 Rudd Rd., Vista	.....	See under Placer gold in text.
D-74 C-80	Rough Diamond	SE¼ sec. 24, T. 5 N., R. 11 E., M.D.M.	Raymond and Mary J. Garamendi, San Andreas	.....	See under Placer gold in text.

QUICKSILVER

B-293	Oro y Plata	Secs. 5 and 6, T. 3 N., R. 14 E., M.D.M., 1 mi. N of Murphys	Mary Bess Norton, c/o J. C. Scoles, Murphys	Cinnabar was reported to have been found with gold ore.	See Lode gold. (Turner 98:8.)

ROOFING GRAVELS

	Minnesota Mining and Milling (Sherwood)	NE¼ sec. 24, T. 4 N., R. 12 E., M.D.M., 1¼ mi. WSW of San Andreas	Minnesota Mining and Milling Co., 900 Fauquier Ave., St. Paul 6, Minnesota	Upper portion of 110-ft. vertical drill hole penetrated unfractured, massive augitic greenstone; lower portion in finer grained fractured greenstone.	Diamond drilled by Minnesota Mining and Manufacturing Co. in 1958, to investigate suitability of rock for use as roofing granules. Purchased from Clyde Sherwood in 1959. (Calaveras Prospect article 5/23/58.)
	Sherwood	.....	.....	.....	See Minnesota Mining and Milling.

SILICA

D-75	Echandi	S½ sec. 16, T. 1 N., R. 11 E., M.D.M., 1 mi. due W of Telegraph City on Calaveras-Stanislaus County line	J. A. and J. T. Echandi, Rt. 1, Box 506, Stockton	Undeveloped massive quartz vein in greenstone is 100 ft. long and 30 to 40 ft. wide.	
D-76	Iron Rock	E½ sec. 14, T. 2 N., R. 13 E., M.D.M., at Carson Hill	Fred G. Stevenot, 300 Montgomery St., San Francisco	Massive quartz vein in Mother Lode belt.	In 1925 quartz mined from massive vein and used as steel flux. (Logan 25:170.)
D-77	Pacific Clay Products	W½ sec. 7, T. 4 N., R. 10 E., M.D.M.	Frank Genoccio and Mark Davis, Camanche; leased to Pacific Clay Products, 1255 W. 4th St., Los Angeles	.....	(Utley 57:72-74, 100; herein.)

STONE *

D-84	Angels	NE¼ sec. 33, T. 3 N., R. 14 E., M.D.M., in Skunk Gulch, 2 mi. SE of Vallecito	Not determined	Fine-grained white marble with faint gray streaks.	Worked prior to 1915 by California-American Marble Co.; two shipments of marble reported. (Tucker 15:129; Logan 25:168; 47:219.)
D-94	Caldwell	NW¼ sec. 35, T. 4 N., R. 11 E., M.D.M., 4 mi. SW of San Andreas	Not determined	Small E-trending lens of dark, mottled marble.	Intermittently active prior to 1906; idle since. Small pit. Marble takes high polish. (Crawford 96:627; Aubury 06:98-99; Logan 47:219.)

STONE—Continued

Map No.	Name of claim, mine, or gorup	Location	Owner (Name, address)	Geology	Remarks and references
	Decorock, Inc.		235 Montgomery St., San Francisco		Sales outlet for rhyolite tuff mined from Snyder and Garamendi quarries and crushed at Tracy by Pacific Cement & Aggregates, Inc. See Snyder, Garamendi. Four sizes of "Decorock" are marketed: 2½- by 1½-in., 1½- by 3/8-in., 1- by 1/8-in., and ½- by 1/8-in. The smallest size accounts for most sales. Crushed rock sold in San Francisco Bay area and northern California in sacks or on rolls as roofing granules. (Lee Collins, personal communication, 1957.)
D-101	Eagle	NW¼ sec. 28, T. 3 N., R. 14 E., M.D.M., near head of Skunk Gulch, 2 mi. E of Vallecito	Not determined	Fine-grained white marble with faint gray streaks.	Small amount of marble shipped prior to 1915 by Eagle Marble Co.; Eagle Marble and Lime Co. acquired property in 1921, but did not ship any rock. Main pit 30 ft. long, 10 ft. wide, 10 ft. deep. Smaller pits and trenches nearby. (Tucker 15:129; Logan 21:424; 25:168; 47:219.)
D-103	Eclipse	NE¼ sec. 75, T. 5 N., R. 11 E., M.D.M., 2½ mi. S of Mokelumne Hill	John J. Fillerup, San Andreas	Mica-quartz schist capped by 2 ft. of overburden. Vertical schistosity. Well-segregated bands of muscovite (2 percent of rock) and quartz give rock good fissility.	Shallow cut in hillside opened 1957; face 6 ft. high, 20 ft. long. To be used for garden stone.
D-106	Garamendi	NW¼ sec. 19, T. 5 N., R. 12 E., M.D.M.	Raymond Garamendi, Mokelumne Hill		Herein.
D-108	Ghost	SW¼ sec. 34, T. 3 N., R. 13 E., M.D.M., near SE city limits of Angels Camp	Not determined	Slabby, massive greenstone.	Rock quarried 1920, crushed, shipped to Richmond for use on roofing paper. Dump material used for road base 1956. See also table 3. (Logan 21:424.)
D-109	Gianelli	SW¼ sec. 17, T. 3 N., R. 14 E., M.D.M., ½ mi. SW of Douglas Flat	Al Gianelli, Douglas Flat (1952)	White rhyolite tuff with 6-in. soil overburden.	Active prior to 1947 and in 1949. Rock hand-trimmed, used for garden and building stone. Larger of 2 pits is 4 ft. deep, 30 ft. in diameter.
D-111	Golden River	SW¼ sec. 19, T. 3 N., R. 14 E., M.D.M., ½ mi. NW of Vallecito	T. E. and E. K. Stearman, Vallecito	Compact, fractured, gray rhyolite tuff.	Small pit, 20 ft. by 30 ft., with 10 ft. face. Inactive for many years.
D-114	Hertzig	NW¼ sec. 32, T. 4 N., R. 12 E., M.D.M., 2½ mi. S of San Andreas	Mrs. Hattie Hertzig, San Andreas	Compact gray marble	This quarry probably the same as Calaveras Cement Co's. Quarry No. 2. No data available regarding early activity. (Aubury 06:99; Logan 47:219.)
D-118	Irvine	W½ sec. 25, T. 5 N., R. 11 E., M.D.M., 3 mi. S of Mokelumne Hill	Robert B. Irvine, 1429 Bronson Ave., Modesto	Fine-grained, compact tuff rests on Eocene quartz gravel. Tuff dips gently SW, ranges from 20 to 60 ft. in thickness, is pink and purplish-gray in color.	Intermittently active 1946-51. Worked for terrazzo chips by Sonora Marble Aggregate Co. 1949; Lava Products Co. 1950; and at intervals by local residents, under contract. Rock blasted and hand-trimmed at 3 adjacent pits. Largest pit 50 ft. by 20 ft. with 40-ft. face; smallest 35 ft. by 10 ft., with 15-ft. face. Rock used as garden stone, building stone, terrazzo chips. (Chesterman 56:36, 95.)

STONE—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
-120	Johnson	NW¼ sec. 3, T. 1 N., R. 12 E., M.D.M., at Copperopolis	Not determined		Active 1949. John Johnson sold crude slag to Plymouth Rock Wool Manufacturing Co., which used it in manufacture of rock wool. By-product glass beads from process were purchased by Johnson in 1950, screened, bagged, or sold in 3 sizes as blasting sand. Crude slag also crushed to 10 sizes (6 to 40 mesh) at Copperopolis, sold as blasting sand. (Turner 51:315; Carlson 54:227, 229.)
	Laidet	Sec. 3, T. 5 N., R. 12 E., M.D.M., on Calaveras River, about 3½ mi. ENE of Mokelumne Hill	Not determined	Three ft. of talc, 50 ft. of soapstone; traceable for 1,000 ft.	No known production. (Tucker 15:131; Logan 25:171-172.)
	Late	Sec. 23, T. 4 N., R. 10 E., M.D.M., near Valley Springs	Not determined	Medium-grained, white sandstone in thick, fractured beds with shallow dip N into hill.	Stone used locally and shipped to Stockton 1870. Idle since. Used as decorative stone. Small quarry. (Aubury 06:117-118; Tucker 15:130; Logan 25:171.)
-123	Lava Point	NW¼ sec. 29, T. 4 N., R. 15 E., M.D.M., 3 mi. SSW of Avery P.O.	Sid Korblick, Murphys	Very hard rhyolite stained and colored by groundwater.	Active 1951-52. Quarry 60 ft. long, 15 ft. high. Rock blasted, hand-trimmed, marketed as wall-rock and garden stone as far as Lodi.
-131	Neilsen Gravel Plant Co.	NW¼ sec. 25, T. 5 N., R. 11 E., M.D.M.	c/o C. W. Neilsen, San Andreas		(Julihn 38:82; Records, Div. Highways, District X; herein.)
	Pacific Cement and Aggregates, Inc.				Formerly Pacific Coast Aggregates, Inc. See Garamendi, Snyder.
	Pardee Dam		East Bay Municipal Utility District, 2130 Adeline St., Oakland 23		Herein.
	Peirano	S½ sec. 11 or N½ sec. 14, T. 2 N., R. 13 E., M.D.M., ½ mi. NW of Carson Hill	Not determined	Soapstone	Active intermittently 1925-28. "Several tons" shipped by Commercial Minerals Co. 1925; 100 tons shipped Nov. 1927. Crude soapstone treated in San Francisco, used for building stone. (Logan 25:171; Calaveras Californian 11/10/27; Logan 36:235.)
-136	Peirano quarry	NW¼ sec. 27, T. 3 N., R. 13 E., M.D.M.	John P. Lemue, Angels Camp		(Heizer 48:116; Chesterman 56:36; herein.)
	Salt Springs dam	On North Fork Mokelumne River	Pacific Gas & Electric Co., 245 Market St., San Francisco 6		57,000 yds. crushed granite produced for aggregate, 1928-31. Specific gravity of rock 2.70-2.74. No other tests made. (C. W. Appleford, Chief Civil Engineer, personal communication, 1958.) Quarry and crushing and sizing plant south of dam.
-147a	Snyder (Tyrrell- Hannah, Pacific Cement and Aggregates, Inc., Decorock)	SE¼ sec. 7, T. 4 N., R. 11 E., M.D.M.	John Snyder, Valley Springs		Herein.

STONE—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Sonora Marble Aggregate Co.	Plant 2 mi. NW of Sonora	Sonora Marble Aggregate Co., 356 Church St., San Francisco	.....	Plant in operation since 1947. Terrazzo chips occasionally obtained from Irvine and Sundborg properties, which see. Four sizes of standard terrazzo chips are produced at plant: No. 1, 8 mesh to 1/4 in.; No. 2, 1/4 to 3/8 in.; No. 3, 3/8 to 1/2 in. combination of standard sizes Nos. 4, 5, and 6, 1/2 to 1 in. chips sold in 100-lb. bags.
	Sundborg.....	Near Vallecito.....	Not determined.....	Yellow marble.....	Active intermittently 1946-49. Marble shipped to Sonora Marble Aggregate Co., crushed, used as terrazzo chips. (Logan 47:219; Turner 51:315.)
D-150	Treat.....	NE1/4 sec. 16, T. 4 N., R. 12 E., M.D.M., 1 1/2 mi. ENE of San Andreas	Not determined.....	Small lens of white, fine-grained marble.	Small prospect pit. (Aubury 06 99; Logan 47:219.)
D-152	Tryon.....	SE1/4 sec. 34, T. 3 N., R. 13 E., M.D.M. in SE portion Angels Camp, E of Hwy. 49	Walter W. Tryon, Box 1093, Rio Vista	Fresh, massive, slabby greenstone.	Operated by Pacific Rock Granule Co. prior to 1925; Angels Greenstone Co. 1925-27; Pacific Minerals Inc. 1928-30; Pacific Minerals Co., Ltd., 1931-41. Inactive since. Rock mined on 200-ft. level, crushed, screened, and sized. Sieve analysis of crushed rock (Logan 25:169): +80 mesh = 5.1%, +100 mesh = 0%, +200 mesh = 14.4%, —200 mesh = 85.9%, dust = 14.4%. Finished products were stucco dash (—3 to +4 mesh), roofing rock (—1/2 inch, +4 mesh), roofing granules (14 to 40 mesh). Concrete mixer used to color granules, 1936. (Logan 25:168-169; 36:235.)
	Tyrrell-Hannah ..	.....	.....	.....	See Snyder.
D-157	Wallace.....	SW1/4 sec. 10, T. 4 N., R. 9 E., M.D.M., 1 mi. N of Wallace	Not determined.....	Fine-grained, unaltered, white and gray rhyolite pumicite. Small bands of opal in north pit. Bedding horizontal at S end of ridge, dips 25° N. at N end. Material contains 77% glass (n = 1.498). Analysis (calcined): SiO_2 = 71.28, Fe_2O_3 = 1.28, Al_2O_3 = 14.04, CaO=1.01, MgO = 0.41, Na_2O = 0.32, and K_2O = 2.47%; total = 90.81% (T. C. Slater, personal communication, 1950).	Two small pits, 15 and 8 ft. deep, in N-trending ridge. Inactive 1956.
D-159	Warren.....	N1/2 sec. 12, T. 3 N., R. 9 E., M.D.M., 4 1/2 mi. NW of Jenny Lind	H. D. Warren, Rt. 1, Box 295, Valley Springs	Lens-like beds of pumice conglomerate and cross-bedded tuffaceous sandstone in 20-ft. tuff layer in Valley Springs fm. Conglomerate is consolidated, contains angular fragments of pumice up to 1 in. diameter, rounded fragments up to 8 in., in pumicite matrix. Pumice more abundant on W portion of property.	Intermittently active 1942-55. Three small pits mined by stripping overburden, pushing pumice onto ramp, passing it through 3/4-inch screen into truck. Used for concrete aggregate. (Chesterman 56:36, 53.)

STONE—Continued

Map No.	Name of claim, mine, or group	Location	Owner (Name, address)	Geology	Remarks and references
	Wildermuth.....	Sec. 1, T. 4 N., R. 10 E., M.D.M., 1/4 mi. E of Campo Seco reservoir	Not determined.....	Soft, coarse-grained, dark gray sandstone.	Used locally prior to 1906. Idle since. Quarry face 20 ft. high, 150 ft. wide. (Aubury 06:119; Tucker 15:130; Logan 25:171.)

*See also Table 3.

TUNGSTEN

D-32	Clark.....	NW1/4 sec. 18, T. 7 N., R. 16 E., M.D.M., 1 1/9 mi. S of Garnet Hill	Moore Creek Mining Co., P.O. Box 78, Pioneer	Small discontinuous tactite bodies in granodiorite gneiss contain small amounts of chalcopyrite and scheelite.	Prospected for copper during World War I; later prospected for tungsten. Developed by shallow open cuts.
D-161	Garnet Hill.....	Secs. 6 and 7, T. 7 N., R. 16 E., M.D.M.	North American Tungsten, Inc., Gazette Bldg., Reno, Nevada	.....	(Jenkins 42:312; Turner 51:316; herein.)
D-162	Moore Creek....	Sec. 7, T. 7 N., R. 16 E., M.D.M.	Moore Creek Mining Co., P.O. Box 78, Pioneer	.....	(Jenkins 42:312; herein.)

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4 MAPS

17-6996

DIVISION OF MINES AND GEOLOGY
IAN CAMPBELL, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

COUNTY REPORT 2
PLATE O

R14E R15E R13E R12E R11E R10E R9E

T7N T6N T5N T4N T3N T2N T1N T1S

STANISLAUS NATIONAL FOREST

CALAVERAS

SAN ANDREAS

ANGELS

VALLEY SPRINGS

MURPHYS

VALLECITOS

ALTAVILLE

MILTON

COPPEROPOLIS

MELONES RESERVOIR

MOKELUMNE RIVER

MOKELUMNE HILL

RAILROAD FLAT

McGRATH RESERVOIR

PARDEE RESERVOIR

SAN ANDREAS FAULT

GOPHER RIDGE

ESTANISLAO

MINERAL SYMBOLS

- Asbestos
- Chromite
- Clay
- Copper
- Iron
- *Limestone
- Mongonese
- Quartz crystal
- Silica
- Stone
- Tungsten

Deposits of stream gravel and tailing

*Not all limestone bodies are shown on this map. Also their locations, size, and contacts are only approximate. See Figure 13 for locations of all known limestone deposits in Calaveras County.

BASE ADAPTED FROM STATE DIVISION OF FORESTRY MAP OF WESTERN AMADOR AND CALAVERAS COUNTIES

Scale in Miles

MAP OF CALAVERAS COUNTY SHOWING MINES AND MINERAL DEPOSITS, EXCEPT GOLD

California. Division of Mines and Geology.
County report.